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# The Making of A Modern Army

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General René Radiguet



for the manuscript

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**Général de Division**

**René Radiguet**

**Former Commander of the 21st Division (Marne), French Army**

# THE MAKING OF A MODERN ARMY

AND  
OPERATIONS IN THE FIELD

BY BYEL ON THE EXPERIENCE OF FIVE  
YEARS ON THE FRONT FROM  
1914 TO 1917

BY

RENÉ RADIGET

GENERAL OF THE 15th ARMY IN 1916

TRANSLATED BY

HENRY FREDERICK BAKER

FORMERLY AMBASSADOR IN THE UNITED STATES

G. P. PUTNAM'S SONS  
NEW YORK AND LONDON

The Knickerbocker Press

1918





# THE MAKING OF A MODERN ARMY

AND

ITS OPERATIONS IN THE FIELD

A STUDY BASED ON THE EXPERIENCE OF THREE  
YEARS ON THE FRENCH FRONT

(1914-1917)

BY

RENÉ RADIGUET

GÉNÉRAL DE DIVISION, ARMY OF FRANCE

TRANSLATED BY

HENRY P. DU BELLET

FORMERLY AMERICAN CONSUL AT RHEIMS

G. P. PUTNAM'S SONS  
NEW YORK AND LONDON

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1918

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BY  
RENÉ RADIGUET

YRABEL RAN RIVOCH

The Knickerbocker Press, New York

A L'HONORABLE NEWTON D. BAKER,  
Ministre de la Guerre,  
Washington, D. C.

EXCELLENCE :

Vous avez bien voulu m'autoriser à vous dédier  
cette étude.

Veillez y voir l'hommage d'un vieux soldat de  
France pour le talent et l'énergie que vous avez de-  
ployés depuis cinq mois pour hâter l'envoi sur le front  
français des troupes Américaines.

Veillez agréer, Excellence, l'expression de mon  
plus profond respect.

GÉNÉRAL RADIGUET.

NEW YORK,  
*November, 1917*



## FOREWORD

DIVERS missions sent to the United States by the Allied armies are now giving the benefit of their practical experience to the American army. These missions are imparting to the officers of every arm the knowledge of the details it is necessary for them to acquire.

The purpose of this book is to show to the American officers, and also to the civilians who take an interest in war matters, how a large army on the European Front in the last quarter of the year 1917 is made up.

In the course of general considerations we have explained what is meant by the words "strategy and tactics"; we have described those interior lines which have been of such powerful assistance to Germany; we have dwelt on the composition of the large units of an army, and more especially on that of a division as a fighting unit.

We have next examined the question of the

command, and we have attempted to define its duties as well as those of the staffs.

We have then devoted special chapters to the study of Aviation, the Field Fortifications, the Artillery, the Supply of Munitions, and the Infantry.

It is not at random that we have placed the various topics in this sequence. It will facilitate the comprehension of the last chapter, in which we describe, with examples, how an attack is to be prepared and by what means its success can be assured.

We have deemed proper to close with a few remarks on the discreditable means of warfare employed by the Germans: they have played too great a part in important operations not to be mentioned.

Our readers will understand the reason why in certain instances we have merely alluded to possible impending improvements of some parts of the armament, without going into details which could not be given without danger.

The few examples we cite have been selected with due consideration. We have either personally played a part in them or they have been supplied to us by officers whom we trust implicitly.

## FOREWORD

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The perusal of this book will enable those who have sons in the European armies to follow them more intelligently through the operations in which they will soon take part, for we are in a position to state that the United States Government has, for the formation of the American army, adopted the figures which experience has taught France to decide upon. Consequently what we say of the French and even of the British forces will apply to the American armies.





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## **The Making of a Modern Army**





# The Making of a Modern Army

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## SYNOPSIS OF THE PRINCIPAL MILITARY OPERATIONS OF THE ALLIES ON THE WESTERN FRONT

It has often been said that after the battle of the Marne the Germans were virtually beaten. The feats of the German armies since that day on such numerous and varied fields, the strength that they have so often been proven to possess, prevent us from concurring in that opinion.

We believe that their defeat will be due to the accumulation of the mistakes they have made.

In September, 1914, their superiority in numbers and in armament was considerable. Their armies were holding in France positions that enabled them, after a rapid reorganization, to assume a new and vigorous offensive against the

French Army, their sole adversary at that time in the West.

The inconceivable pride of the German military party had encouraged it to despise the enemy, and to blindly undertake that formidable rush through Belgium for the capture of Paris. This dream vanished under the blows struck by General Joffre and his marvellously responsive armies.

Her hatred for England in the first place, and in the second, her thirst for conquest, were about to lead Germany to commit serious blunders, and to lose the prize by grasping at its shadow.

To prevent the mobilization of the British armies, the Kaiser, after entrenching his forces on the French Front, sent all the troops he could dispose of against Calais. He felt so sure of success that he followed the operations in person, ready to enter as a conqueror into the city he expected to capture. He had acted in the same way two months before at Nancy; and having failed in that effort, he was eager for revenge.

The French, British, and Belgian armies took care to transform his cherished revenge into a pitiful defeat.

It was then that the German Command com-

mitted the mistake which will cause Germany to lose the war.

Leaving the Western Front, giving to the French and British armies time to reorganize, arm, and gather strength, the Germans, having lost all hope of achieving the dreamed-of victories in the West, hurled their legions upon Russia, which they knew was insufficiently prepared, and began that campaign which was to result in their capture of Poland and the Baltic provinces, and the recovery of Galicia.

The consequences of the adoption of this new plan were to be seen at once.

At the beginning of the summer of 1915, in Artois, the French and British commenced to strike blows which proved that the strongest system of field fortifications can be taken.

In September, 1915, General Pétain, in Champagne, inflicted a terrible defeat upon the Germans. This operation, carried out simultaneously with one in Artois, cost them thirty thousand prisoners, one hundred and fifty guns, heavy casualties, and—which is even of greater importance—obliged them to abandon highly valued and strongly fortified positions.

In the beginning of 1916, having fulfilled their

program in Russia, the German General Staff resolved to finish with the Western Front, and attacked Verdun with such enormous forces of artillery and infantry as had never before been known.

Everywhere in Germany the announcement was made that the assault and capture of Verdun would bring the war to an end.

Every one knows how vastly they were deceived. The French, taken by surprise and shaken at first, rallied rapidly. During five months they contested the ground inch by inch with a tenacity and heroism that stamps the defence of Verdun as the most sublime military feat recorded by History. The Germans did not take the fortress-city, but sacrificed in their attempt the very flower of their armies.

Verdun had not exhausted all the strength of the French armies. On the first day of June, 1916, on the Somme, General Foch attacked the Germans so furiously that they had to suspend entirely their offensive against Verdun.

On July 1st, the British Army, which had been developing to its final form and efficiency, took its place on the left of the positions of General Foch, and from that time on the Germans were

forced to transfer most of their effectives to the Somme and the Aisne in order to oppose the Franco-British advance.

The fight begun in these regions in the summer of 1916 has continued until now with scarcely any interruption. Slowly but surely the Franco-British have driven the Germans from all the positions they considered impregnable. They will continue by this method to push them back into Germany.

The French armies on the left and on the centre undertook in the spring of 1917 some very large operations on the Aisne and in Champagne, which have given them possession of dominating positions, such as the "Chemin des Dames" on the Aisne, and the hills of "Cormillet," "Teton," "Monhaut," and "Mont-sans-nom" in Champagne, which will be of great value for future offensives. The capture of those hills, which the Germans had proclaimed *impregnable*, followed naturally upon the successes gained in 1915 by the Army of General Pétain, and were completed by numerous smaller operations too long to enumerate here.

On the Aisne the advance of the French has not been delayed by the famous Hindenburg

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On the Aisne the advance of the French has not been delayed by the famous Hindenburg



## 6        MAKING A MODERN ARMY

retreat. From the very beginning the Germans have accustomed us to the most astounding bluffs, intended more to blind their compatriots than to frighten their adversaries, but the famous letter in which the Kaiser complimented Hindenburg on his "masterly retreat" (*retraite géniale*) is certainly the most stupendous bluff on record.

Let us, Allies, pray God that the old Prussian Marshal may often be afflicted with such masterly ideas! These should certainly take us to Berlin.

For the purpose of recapturing the Chemin des Dames, the Germans have recommenced on the Aisne a series of those reiterated attacks in mass-formation which had cost them so dear at Verdun in 1916, and which are now no less costly and unsuccessful.

### THE MILITARY SITUATION IN OCTOBER, 1917

Two great facts dominate the situation to-day.

1st. The great success won at Verdun in August, 1917, by the French, who in two days retook the positions that had cost the Germans five months of ceaseless assault and enormous losses in men and material. It is indeed a most remarkable success, considering that the German General

Staff, in the defence of the ground so hardly won, employed every means known to military science.

The last battle of Verdun evidences the superiority that the French artillery has gained over the German artillery.

2d. The recent victories of the British Army and those of the French Army under General Anthoine in Flanders. Both French and British have made continuous progress despite most unfavorable weather conditions—fog, rain, and deep mud. The lines of communication of the Germans with the Belgian coast are threatened, and the occupation of the Belgian coast by the Allies will put an end to the hopes Germany has based upon her submarine warfare.

The significant feature of these latest French and British victories is the fact that the German armies now find it impossible to react in time—or, in other words, to check an assault by launching prompt counter-attacks.

The difficulty that the two Crown Princes experience in finding immediately and on the moment troops sufficient for energetic attack, proves:

1st. That notwithstanding the withdrawal of various contingents from the Russian Front, they are short of reserves;

## 8        MAKING A MODERN ARMY

2d. That the quality and the morale of their troops have declined, which is also evidenced by the large number and inferior fighting-value of the prisoners taken.

These are signs which foreshadow not only the final victory, which is not doubtful, but even a more rapid termination of the war than could have been anticipated six months ago.

While the approaching entry of the American armies into the fighting lines will be, from the start, of great importance for the military situation, the participation of the United States in the war has already produced in Germany a moral effect that the German authorities are vainly trying to conceal. The number of the adversaries of the military power increases every day, and even Prussian brutality is powerless to prevent the diffusion of the idea that the leaders of the Empire have terribly blundered in turning the whole world against Germany.

Germany suffers much, and her sufferings can but increase, owing to the insufficiency of the harvest in Europe.

Let us remember the prediction of a man who knows Germany well, the former Representative from Alsace in the Reichstag, Father Weterlé.

"After her defeat," he said in 1915, "Germany will astonish the world by her cowardice."

May his prediction prove true!

We will now consider the general principles of the French military organization, which are based upon experience dearly bought during the past three years of war.

The American armies will be constituted upon a similar plan.

## 8      MAKING A MODERN ARMY

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## CHAPTER I

### WAR PRINCIPLES

(For 1917)

1. The rules of strategy and tactics have not been modified.  
The mode of fighting alone is different.
2. Violation of the laws of warfare. Influence of science.
3. Fighting units. The Army. The Army Corps. The Division. The Command. The Staff.

**1. Strategy and tactics are unchanged.** *Strategy* is the art of manœuvring large armies over a great extent of country.

*Tactics* is the art of handling the troops on the battlefield.

One might be inclined to believe that, in the present war and since the victory of the Marne, the general rules of strategy and tactics have been modified. Not at all. The ways of fighting and the armament only have undergone a transformation.

The opposing lines have buried themselves in mazes of entrenchment. On both sides old methods

of warfare and weapons forsaken or forgotten for centuries have again been gradually resorted to. The "Minenwerfers," the trench guns, are nothing but the old-fashioned mortar much improved upon. The jet of liquid fire driven by compressed air, finds its prototypes in the Greek fire of Constantinople and the hand-thrown combustibles—boiling oil and burning pitch—of the Middle Ages.

**STRATEGY.** The rules of strategy remain immutable. They still consist in attacking the enemy on one of his wings; in attempting to outflank him on one side; in trying to cut his line in two by a blow in the centre; in organizing a system of transportation so that the necessary forces may be quickly assembled at the points which are to be attacked or protected; in taking advantage of a superiority due to the possession of well-organized interior lines. Such are the ancient basic principles, that, in various combinations, have been applied by contending armies since the dawn of military science.

*Examples.* When the Germans attacked on the Yser front, their purpose was twofold: 1st. To outflank the left wing of the Franco-Anglo-Belgian Army; 2d. To force their way towards

## 12      MAKING A MODERN ARMY

Calais and Dunkirk so as to prevent England from using those harbours for the concentration of her armies in France.

After her failure on the Yser front, Germany made use of her superiority in interior lines, composed of the railway lines existing before the war, supplemented by new ones built as they were needed for military operations. Owing to her central geographical position, Germany is able at all times to dispatch forces from the heart of her Empire to the various fronts; from Russia to the French Front, and *vice versa*. To these interior lines is due the facility with which she has quickly concentrated large masses of troops at any desired point, notably on the Roumanian front at the end of 1916.

When she had firmly consolidated her Western Front she rapidly collected all her available forces on the Eastern Front in an effort to crush the Russians.

When, in February, 1916, the Germans launched the gigantic attack against Verdun, it was with a twofold strategic purpose: 1st. To pierce the French line between right wing and centre and resume the march on Paris. 2d. In case of a partial success, to strengthen themselves by

the occupation of Verdun, with a view to preventing the French armies from reaching the right bank of the Meuse, while at the same time guarding their own left wing and their communications with Metz, should circumstances ever force them to withdraw behind the Meuse.

During the autumn of 1915 the French attempted to avail themselves of the comparative weakness of the Germans due to their campaign against Russia. A favourable issue would have taken them to Vouziers-Rethel, and very possibly have caused all the German lines to be withdrawn from around Rheims and Soissons.

We might vary these examples. Quite recently, the British troops have resumed the attack planned in 1915 by the French in Artois. They will gradually free the North of France and Flanders.

**TACTICS.** Let us now consider tactical operations as they are conducted on the battlefield. The formidable field entrenchments constructed by the Germans have compelled both combatants to transform their artillery and to change the armament of their infantry.

The manner in which the different arms are employed on the battlefield has changed but little.

## 14      MAKING A MODERN ARMY

The field artillery has been enormously developed and it has been necessary to constantly increase the power of the cannons and howitzers. We shall later on discuss this subject more fully.

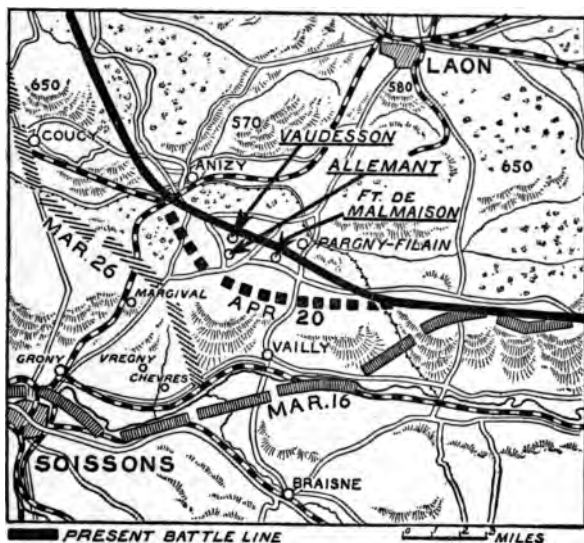
The definition of tactics as given by General Pétain, the French Generalissimo, in the course of his lectures at the "École de Guerre" has not been modified by the creation of these improved weapons. He said: "The Artillery conquers the positions, the Infantry occupies them."

We will take for example a quite recent military feat which strikingly establishes the distinction between the strategical and the tactical operations.

On the 22d day of last October (1917), the French Army in the North, east of Soissons, scored one of the most important successes of the year. This operation, carried out on a nine-mile front, was essentially tactical. It had for object the capture of very important positions forming a salient in the French lines, which furnished the Germans with facilities for an offensive return to Soissons. The capture by the French of *Vaudesson-Allemant* and the *Malmaison fort* eliminated the salient, opened the road to Laon, and exposed the German lines on the Ailette to an enfilading fire.

This tactical operation was evidently a part

of a vast strategical plan matured by the French and British Commanders-in-Chief. The general purpose of these operations aims at forcing the Germans to abandon the North of Belgium and



BATTLE FIELD OF THE FRENCH OFFENSIVE OF  
THE 22d OCTOBER, 1917.

to retreat in France. All the tactical operations being carried on in Flanders, on the Aisne, in Champagne and Lorraine, are parts of this single plan and have the same object in view.

The rapid campaign just conducted by Marshal von Mackensen against the Italians in the Julian Alps, like that he led in 1916 in the Dobrutcha and

Roumania, are evidences that the old principles of war, and especially those practised by Napoleon, are still fully adhered to by the German armies.

**2. Violation of the laws of warfare. Influence of science.** We must acknowledge that, although the Germans had hoped in 1914 for a quick victory gained by a few overwhelming blows, they had also, during their forty-four years military preparation, provided for the possibility of a check, and had equipped themselves with a mighty artillery which enabled them to hold the Western Front while fighting against Russia.

France had to make great efforts to complete her armament in 1915. Germany had already accomplished this in a great measure before the war commenced.

It was reserved for German science, if not to render war more bloody (the weapons used in 1914 sufficiently fulfilled this purpose), to violate all the laws of warfare enacted by all the Governments, even by the German Government itself.

German science has given birth to gigantic cannon which no law forbids (we shall speak of these further on), but German science will bear, in the judgment of History, the responsibility of

having added to the horrors of war an unprecedented ferocity and savagery by the introduction of asphyxiating gases, tear-producing gases, and burning liquids.

But we may add that Germany in her turn already suffers greatly herself from her inventions; the Allies having been compelled to adopt and use similar and often much improved weapons.

**3. Fighting units.** The fighting units are composed of a variable number of tactical units. The tactical unit is the Division, the composition of which will hereafter be described. It includes infantry, cavalry, artillery, and engineers. It ought to possess also, and we hope it will soon, a special service of aviation.

A group of two or three and sometimes four Divisions constitutes an Army Corps. The union of three, four, or five Army Corps forms an Army. In this war, two or three armies placed under one Command form an Army Group. Four or five of these Army Groups exist on the French Front. The general organization of the British differs but little from that of the French armies. Whatever difference there may be exists rather in the organization of the rear than in that of the front.

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The British occupying a much shorter front, dispose of a proportionately larger number of men. Though the bulk of their forces have been but a short time in France, they have received from their women workers very intelligent and valuable assistance, and, having at their disposal larger appropriations of money, have been able to do much more than France towards perfecting the organization at the rear.

The Army Corps and the Division must be organized so as to be entirely and under all circumstances self-sufficient. They may, however, rely upon any reserve forces that the surrounding armies may place at their disposal, according to the work assigned to them.

### A GLANCE AT THE NORMAL COMPOSITION OF A DIVISION

The real fighting unit is the Division. We purposely do not call it a Division of infantry. The Division forms a whole by itself. It is composed of all the different arms in the proportions that have been deemed necessary to the efficiency of the whole body.

INFANTRY. Besides its Staff, which is the voice of the Command, a Division normally includes

two brigades of infantry of two regiments each. The necessities of the present war have compelled the belligerents to reduce to three regiments many of their Divisions, and only the crack Divisions selected for attack have been kept up to four regiments.

**ARTILLERY.** Each Division includes, under the command of a colonel: 1st. One regiment of field artillery with three groups, each of three batteries each of four 75 mm. cannon;

2d. One regiment of heavy artillery with one group of 155 mm. quick-firing cannon;

3d. One battery of trench guns, the number and the size of which vary.

**ENGINEERS.** A French Division includes one half battalion of sappers and miners, which is not sufficient; two battalions at least ought to be attached to it. The rapidity and solidity with which the German entrenchments are constructed is due to the great number of engineer battalions which our enemy possesses.

**CAVALRY.** A Division also includes two squadrons of cavalry. In the trenches they are dismounted and used as connection-agents (*agents de liaison*). Their duties will be considered at another point.

**AVIATORS.** A Division ought to possess its own aviation corps; planes for reconnoitring, planes for directing the fire of artillery and the movements of infantry, and swift battle-planes without the protection of which all other flying-machines are exposed to great dangers.

We cannot insist enough on the necessity for the American Army to be uncompromising concerning the perfect organization of its aviation. Reasons which we lack space to discuss have so far prevented the French section of aviation from having the complete general organization it ought to have.

**SUPPLY.** All the services for the supply of munitions, and for the repair and renewal of material, are centralized in a divisional Park. To the supply of munitions we shall devote a special chapter.

The supply of provisions is entrusted in a Division to a sub-commissary of stores. The Commissariat Department is part of the general service at the Army base, and its study would lead us beyond the limits assigned to this exposé.

**MEDICAL DEPARTMENT.** Every Division has its own medical department. On this point, too, we shall abstain from entering into details. Let


us however remark that the medical service is still susceptible of much improvement. In spite of continuous improvements in its organization, in spite of the generous assistance of our Allies, of neutral countries, and particularly of our American friends, the recent engagements have proven:

1st. The insufficiency of the means at hand for rapidly collecting the wounded on the battlefield;

2d. The insufficiency, near the battlefield, of large field hospitals for the operations that cannot be delayed;

3d. The lack of special hospitals just out of range of the enemy's guns, where the severely wounded (*grands blessés*), and particularly the abdominal cases, can remain as long as necessary. It is generally acknowledged that those who have been wounded in the abdomen require immediate surgical aid, and cannot be removed to a distance without undue risk. Such dangerously injured men should therefore be provided with "Rest hospitals," where they can remain until able to be transported to the base.

The transportation of the wounded should be the object of a very close study. The trains for the transfer of the grave cases should be further



improved, their speed increased, and their appointments so arranged as to allow the wounds to be dressed during the trip. Many cases of gangrene would thus be avoided.

This is said without prejudice to the wonderful improvements which have been made during the last three years. The devoted service rendered to France by her military Medical Corps cannot be too highly praised.

American army surgeons, who have benefited by the vast experience and wonderful skill of Dr. Alexis Carrel at the War Demonstration Hospital in New York, will be able to do more for the relief of suffering and the saving of life than their ablest French confrères could accomplish three years ago.

THE COMMAND. The characteristic qualities of a "Chief" in the present war must be:

1st. A very great physical endurance to render possible a great activity. The General commanding a Division must actually see with his own eyes every detail of the enemy's positions. He must acquaint himself with the nature of the ground occupied by his adversary as well as with the strength of the latter's defences. Such inspections will often take him to the trenches, where

his presence will keep up the spirits of his men better than any exhortation written at a distance.

2d. The Chief must take in the situation at a glance. He must be composed, and a man of prompt decision. Only on a thorough knowledge of all the facts will he base his final dispositions for a fight. We are of opinion that, especially in the present war, when a decision has been taken or an order given, it is always advisable not to modify these except in details of execution which cannot interfere with the operation as a whole.

3d. During the battle, the Division General should establish his post of command at a spot whence he may, if possible, see the ground where his troops are engaged. He should, in any case, be where he can keep in touch as long as possible with the generals or colonels of the infantry under his command, and with his artillery and his information section.

4th. The Chief of any unit in war time is responsible for the physical and moral condition of his troops. He will keep their spirit at a high level if he proves to be as strict with himself as with his subordinates. In all circumstances, he should treat them with justice and kindness, but should be pitiless to bad soldiers.

He should by frequent personal inspections make sure that his troops have good food, shoes, and clothing, and that their small arms and artillery are perfectly kept, whatever the weather may be.

Some commanders of infantry Divisions, during the present war, have neglected to take as good care of their artillery as of their infantry. This is a mistake to be avoided. There are no more infantry Divisions. Our Divisions are composed of all arms, each having a special utility, and all must, without any discrimination, receive the care and supervision of their Chief.

**THE STAFFS.** The unit commanders need the assistance of officers thoroughly imbued with their thoughts, able to express and transmit them faithfully.

*Chief of Staff.* In every unit we have a general or superior officer, called "Chief of Staff." In a Division taken as a unit, this officer is entrusted with the direction of all the divisional services and the services at headquarters. He is responsible to his commander for the perfect working of all these services, and also for the wording and prompt transmission of all orders.

While the task of inspecting the troops (especially the fighting troops) rests with the General,

the Chief of Staff should more particularly inspect the non-combatant services and personnel, namely, the Health, Supply, Treasury, and Post Office Departments.

*Staff-Officers.* It would be a great mistake to divide the staff-officers otherwise than into two very distinct classes:

1st. Staff-Officers proper, who are the direct assistants of the Chief;

2d. Office Staff, entrusted with all the clerical work, except that concerning the preparation and conduct of the operations, and the report thereon.

The latter need not possess military science. They can efficiently fulfil their duties if, as civilians, they have been trained to prepare written reports, and they need not possess the physical endurance necessary to the staff-officers proper.

To be efficient, a staff-officer needs to possess military science, judgment, tact, physical strength, great activity, bravery, and self-abnegation.

By adhering to the above classification, the American Army will have no trouble in forming excellent staffs. In fact, it will not have to triumph over a routine that three years of war has not entirely eliminated from our old European armies. Too often we injudiciously employ for



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tasks unfamiliar or unsuited to them officers capable of rendering much greater services elsewhere.

The staff-officer will be efficient if he performs the following briefly stated duties:

The staff-officer must complete by a minute reconnoitring the inspections previously made by the General himself. He should never hesitate to go to the very first lines, and it will be often necessary for him to go under the protection of patrols of infantry, and ascertain in person to what extent the first lines of the enemy have been destroyed, how much damage has been done to the wire entanglements and defences, etc.

The staff-officer must be a perfectly trained aerial observer. He should also be competent to detect on the different photographs furnished by the aviators the least damage done to the enemy's works by the successive projectiles. This task, which must be accomplished most conscientiously, requires excellent eyesight.

We do not hesitate to say that, in the present war, it would be criminal insanity to deliver an attack without being sure that the enemy's wire defences have been sufficiently damaged; at least to such an extent as will allow the infantry to pass

through them. A staff-officer should not at this most important juncture trust implicitly to the information furnished him in reports from the first lines or found in the photographs taken by the aviation, but he ought to go and see for himself and report minutely to his Chief.

These are dangerous missions: hence the need of having staff-officers in reserve. It has been repeatedly proved that officers who have not been trained at the Ecole d'Etat Major (staff school), but are experienced and efficient men, quickly become excellent substitute staff-officers.

Their principal duties may be summed up as follows:

Keep their Chief informed before, during, and after an operation.

Their office work ought to be limited to the writing of orders and reports concerning the operations. This is easy of accomplishment when the commander has a comprehensive grasp of the situation, and gives his staff clear and concise orders, which they have only to put into effect in due form.

The staff-officer must also act as an intelligence officer. As close to the General's headquarters as possible, a staff-officer must establish a centre

of information, where he will keep a force of men and all the equipment that will enable him to keep in constant communication with his General, with the infantry, the artillery, the captive balloons, all the services of the aviation, etc. When a reconnoitring aviator returns with some important information, unless he has been able to communicate it by wireless, he lands as near as possible to the intelligence bureau, gives to the staff-officer in charge an account of what he has seen, and flies off. The staff-officer transmits immediately to the proper quarter the information he has just received, and it is his duty in all important cases to make sure that his message has reached its proper destination. If telephonic communication has been interrupted by any accident of battle, he must despatch some of the estafettes, dispatch-runners, or carrier-pigeons at his disposal.

## CHAPTER II

### AVIATION

1. Its military beginnings. Its increasing importance.
2. Its use and scope.
3. Different kinds of aircraft. Battle-planes. Bombing-planes. Observation- or scout-planes. Employment of scout-planes for the direction of artillery-fire and the movements of infantry. Aviation during a battle.
4. Hydroplanes.
5. Balloons, Zeppelins.

**1. Its military beginnings, its increasing importance.** At the beginning of the war, Germany alone possessed a military flying corps. She was the only nation who desired war. She was the only one prepared, in this as in other respects. Her foresight was duly rewarded.

Though still few, her aviators found themselves the masters of the air. They made themselves very useful to the German Command by observations that enabled them to locate the principal French forces. They rendered also great services to their artillery during the actual fight-

ing. A German machine, while clumsily flying some 3000 feet above the French batteries, would send up a rocket, and a few minutes afterwards 150 mm. shells would begin to fall on the spot thus indicated.

If, at the time, the Germans had been as expert as they are now in pointing their guns, these air-directed bombardments would have had more efficacious results, but even as it was, they invariably produced a deplorable impression on the morale of the troops who felt themselves at the mercy of a shell-fire which the French artillery could not return for want of howitzers.

Aviation had developed itself mostly among the civilians in France. Overnight, as it were, our civilians became military aviators. They showed great bravery and a few at once proved themselves remarkable. Their machines, though speedy, as speed was reckoned in those days, were in many ways inadequate for the purposes of war, but they were none the less extremely effective.

Since 1914, all the belligerents have, with more or less success, considerably developed the scope of their aviation.

In France there was too much indecision as to what types should be adopted.

The production of standardized machines encountered serious difficulties. Construction was slow. Factories either lacked machinery entirely or were insufficiently supplied with it.

Till the autumn of 1915, Germany retained the supremacy in the air. From that time on the situation gradually altered in favor of France, and since the arrival of a large contingent of British machines, the Allies have maintained a marked superiority on the Western Front. When the American air-corps has added its strength to the French the end of the German aviation will be close at hand.

It is well nevertheless to note that the Germans, fearing the advent of the American airmen, are now making a powerful effort to double the number of their planes; and, aided by a careful study of the Allies' machines which have fallen in their lines, are busy constructing more and more formidable examples. The Allies, in the meantime, are daily improving their own, and the Americans have lately had the occasion to see that Italy, one of the most recent aviation recruits, has nearly reached perfection in aircraft construction.

In order to render promptly the anticipated

aid, the United States should, at the beginning at least, adopt thoroughly tested types of aircraft, of easy control in the air; and should construct several standardized motors.

After trial *on the French front* some types may have to be modified, but only after the American aviation corps has made sure that, in any event, it will have a sufficient number of aircraft in France while awaiting the arrival of the new models.

Airplane construction has been hitherto, and will continue to be, constantly progressive. An improvement much needed is a device for the protection of the gasoline tank, which on most of the existing types is too vulnerable and too frequently set on fire. Very often the Germans aim at the tanks rather than at the pilot, as the former are easier to hit and the result is the same.

**2. Use and scope of aviation.** Our opinion is that during the present war no real success can be obtained without the help of numerous and daring aviators. During the days preceding an attack (in the trench war) or in order to hide the movements of the troops (in the open field) it is of the utmost necessity to maintain the su-

premacv in the air. The enemy's aviation must be entirely blinded. Not one enemy machine must pass over the lines. The captive balloons must be destroyed. In brief, the aviation must be powerful enough to prevent the enemy from having any knowledge of our preparations, and above all from ascertaining the exact point whence the main attack will be launched.

Besides the work it will have to do on the front (with which we will deal hereafter) the aviation of bombardment will, during the period of preparation, have to make numerous raids on the enemy's rear, hurl destruction upon the aerodromes, and into the camps of the staff and reserves, blow up the important ammunition and food stores, attack the trains, destroy the railway lines, especially at the junctions, set the stations on fire, and attack all detachments and convoys on the roads.

Briefly, the aviation should, during the preparation for an attack supplement at the rear the disorder created at the front by a prolonged bombardment. If these desiderata are complied with by sufficiently numerous and powerful aircraft, the enemy will find themselves in evident inferiority at the moment of attack.



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**3. Different kinds of air-craft.** There are several kinds of airplanes:

**BATTLE-PLANES.** The importance of the fighting aviation far exceeds that of the other kinds, owing to the fact that whatever their mission, the latter cannot keep the air either on the front or during the raids back of the enemy lines unless they are protected against the attacks of the opponent's aircraft by a sufficient number of lighter, swifter, and more easily manœuvred battle-planes. The organization of the fighting aviation ought, therefore, to claim the principal and most careful consideration of the commanding officer in charge of all the different services of the flying corps.

Fighting machines must be very numerous, and piloted by cool, competent aviators, masters of their machines and possessing what, in France, our soldiers call "Cran"; *i. e.*, Pluck.

At the present moment there is an obvious tendency to abandon monoplanes in favour of small, very handy biplanes flying 220 kilometres an hour. Our renowned "aces," such as the late Captain Guynemer and so many others, have, until now, fought single-handed, piloting and shooting at the same time. We are returning to

the idea of placing two men on these fighting machines.

Some of these are already fitted with two very light and extremely accurate machine-guns, the front one being fixed so as to shoot through the screw. This result has been obtained by the use of a device so marvellously accurate that the ball at its exit from the barrel of the gun never hits the blades of the screw speeding at more than one thousand five hundred revolutions a minute.

For a long time, our French aviators operated separately, but the Germans having taken the habit of flying in groups, our aviators, in most cases, fly now in squadrillas so as to be able to help one another.

The battle-plane aviators fly at great heights, hiding themselves behind the clouds, and, when they see an enemy machine below them, they drop on it with all speed and attempt, while keeping above it, to shoot it down.

When they are attacked, they try to rise and gain the advantage of position. Their tactics, in brief, consist in getting as much as possible out of an enemy's range, and in attaining such a position as will enable them to reach him.

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Some of these fights last ten, some fifteen minutes.

When the weather allows flights, there ought always to be several battle-planes in the air to protect the other kinds of airplanes.

One must lay down as a rule, and we here repeat the opinion expressed by famous aviators, that every attack, whether by a single machine or by a squadrilla, must always be carried out with the utmost vigour. The Germans seem, indeed, to have received orders to fly away whenever they feel themselves inferior.

An important function of the battle-planes is to escort and protect the scouting or raiding squadrons during their operations, so as to allow the latter to fulfil their mission without having to guard against any possible attack of the enemy.

During these expeditions the battle-plane is to the other airplanes what the destroyers are to the ships they convoy. In order that they may afford efficient protection to the ships, the destroyers must be very fast and manageable; likewise the chasing airplanes must of necessity be more rapid and manageable than those they are sent to protect.

**BOMBING-PLANES.** The number of machines

composing a squadrilla of bombardment varies. Several squadrillas often start together to accomplish a mission, forming an aërial army. The machines thus detailed must be able to carry a heavy load of ammunition, also a provision of gasoline sufficient to allow them to remain a long time in the air.

To realize the progress made in the construction of such machines one has but to remember that, on the 15th of last October, an Italian airplane carrying a great weight in addition to its supply of gasoline, covered the distance from Turin to the English coast in ten hours.

The Italians have now at Washington a machine carrying twelve persons. All the Powers are building large airplanes intended to make bombardments more and more deadly.

At first, ordinary bombs were dropped from airplanes, but they are now supplied with special bombs filled with the most powerful explosives known (winged torpedoes), and also incendiary and asphyxiating projectiles. Special devices have been constructed which increase the accuracy of the aim, when dropping bombs.

These bombing-planes are armed with quick-firing guns, but are less handy and manageable

than the battle-plane, whose protection, therefore, they require.

We are confident that our American friends will develop to the extreme limit their aviation of bombardment, and will train a great number of their aviators for long-distance flights by night or day. Very many of the most important military establishments in western Germany are within reach of our blows. Up to now the insufficiency of our material has been the sole reason of the failure of our aviation to attempt the destruction of her plants at Essen, Cologne, Mannheim, Metz, etc. Certain expeditions have proved that all these places are within the reach of fairly good machines piloted by well-trained aviators.

What would become of the Essen works the day that 1200 or 1500 airplanes attacked them in groups of 30 or 40, following each other at ten-minute intervals; some bombarding the works with high-power torpedoes, others with incendiary bombs, others with suffocating projectiles, utterly demoralizing the workmen and spreading terror in their midst?

Certainly there would be losses, for the Germans have surrounded their works with numerous anti-

aircraft guns, but would the more or less complete destruction of the Essen works be too dearly bought by the loss of a number of machines? Moreover we do not believe that a raid on their big plants, if well prepared and well carried out, would be very costly.

The use of aviation to destroy the enemy's munition plants will, in our opinion, greatly hasten the end of the war, and spare a large number of lives.

If the war lasts, the long-distance aviation will have to be employed very extensively during the summer to set fire indiscriminately to the harvest in the enemy's country, and even in the territory which they occupy as invaders, since there is no reason to spare the invaded sections as long as the natives are not allowed to have their share of the crops. Furthermore, devices will have to be invented to facilitate this work of destruction.

It is materially impossible to give the bombing-machines a speed equal to that of the battle-planes. Great importance however must be attached to the choice of motors and to obtaining the greatest speed possible.

All these machines have two propellers and some are provided with three motors.

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The first bombing expeditions were undertaken during the first months of the war. From the very beginning, the Germans realized that airplanes could go far and strike dangerous blows. Paris was bombarded as early as September, 1914. In time, and as the machines were improved, the bombardments became more disastrous. In the course of the first half of 1915, British aviators dropped bombs on Friedrichshaven, the Zeppelin station on the Lake of Constance; French aviators attacked Stuttgart and Carlsruhe; and since the beginning of 1917, the Germans have multiplied their raids on London and the coasts of England.

We believe that bombing aviation, for purely military purposes, will assume an ever-increasing importance in the war.

**OBSERVATION OR SCOUT-PLANES.** On the French Front the old types of reconnoitring machines are being replaced as quickly as possible. They were too slow and not easy to control in case of an attack.

The services rendered by the reconnoitring airplanes are of the greatest importance. Their observations supply the Command with accurate information concerning everything that is taking place within the enemy's lines; the condition of

his front; the movements of troops in his rear; thus enabling the Chief to foresee his intentions and foil his plans.

In addition to reports of what they observe during their flights, the pilots obtain aërial photographs. This very important adjunct of our modern armies has been considerably improved.

Photos taken at an altitude of 2500 and 3000 metres (8000 to 10,000 feet) reproduce so accurately the configuration of the land with every object on it, that trained officers are able to observe in them the smallest changes that have been made. With this object in view they compare together several photos of the same place taken at different dates.

We include in our volume some aërial photographs of the German lines in the Aisne sector taken at the end of December, 1916, in January, 1917, and in April and May, 1917. The first show merely the enemy's works before the French bombardment. The pictures taken in April of the same ground give an excellent idea of the progressive effect of the French artillery, and the last photographs, taken during the attacks of the 5th and 6th of May, show the final result of the tremendous shell-fire. In order to compare the



changes effected from time to time, it is necessary to use a magnifying-glass, and to note successively each observation on a large-scale map called a "directing map." This minute, painstaking method alone will enable the Staff to form an idea of the effect of the artillery, and the progressive demolition of the works and trenches of the enemy. Later on we will see that the observations reported by the reconnoitring aviation influence in a great measure the dispositions taken for attack.

The British attach, and rightly so, such importance to a strictly accurate record of the effects of their fire, that they are not satisfied with the usual charts, but construct for their principal staffs large-scale relief-maps including both their own and the German lines, works, and batteries, as revealed to them by photographs taken from airplanes and captive balloons. Officers of the General Staff are specially entrusted with the duty of recording on this relief-map all damage and destruction as fast as it is reported. When the order of attack is given, the British chiefs, knowing as far as it is possible what works they will find destroyed, and what points will offer a more or less stubborn resistance, make their dispositions accordingly.

No attack is possible if the Command is not daily informed by the photographic section. Even after a continuous bombardment it is more prudent to defer an attack if during the preceding days the weather has been so bad as to prevent the use of the aërial cameras.

USE OF SCOUT-PLANES TO DIRECT ARTILLERY FIRE. Special and sufficiently numerous squad-rillas must be reserved for the exclusive use of the artillery, and more particularly for that of the heavy artillery in order to supply them with the proper range.

At times, captive balloons can help the heavy artillery in this respect, the gunners preferring them to airplanes; but these balloons are not always sufficiently numerous and cannot always see far enough.

The guiding airplane informs the batteries to which it is assigned of the effect of their shell-fire by means of wireless telegraphy, which has the advantage of not being interrupted by the terrific noise of the bombardment, whereas telephonic communication with a captive balloon is impossible without the use of special "hearing masks."

Different kinds of rockets can also be employed

for indicating the range under certain circumstances.

**USE OF SCOUT-PLANES TO DIRECT THE MOVEMENTS OF INFANTRY.** The squadrillas of a Division are provided with devices for guiding the movements of infantry.

Their duties are manifold. At all times they are kept hovering over the first lines to watch the enemy and give warning of all unusual moves.

During an assault their principal duty is to secure the indispensable unity of action between the infantry and the field artillery. As we will explain further on, every attack made by the infantry is screened by a terrific barrage fire that advances about one hundred yards ahead of the first wave. In order that such a barrage may continue to be properly effective it must progress at the same speed as the infantry.

For this purpose scout-planes are equipped with a special rocket, that signals, "Increase the range." Each rocket sent calls for an increase of one hundred metres in the range.

During the fight the duties of the aviator as watchdog of the infantry do not cease. He has to observe the slightest moves of the enemy, and he is usually able to warn his commanders of the

preparation of counter-attacks, of their direction, and of their strength.

The services rendered by the guiding aviation to the artillery and infantry are obviously of capital importance. Its mission, if properly executed, is extremely hard and laborious, hence the necessity, in the future, of increasing the number and efficiency of these squadriglias as much as possible. In order that they may operate successfully they must be closely protected by powerful battle-planes, unless the latter have already cleared the region of enemy machines and left them the mastery of the air.

AVIATION DURING BATTLES. Since the battle of the Somme, the British and French aviation has taken, day by day, a more and more direct part in the actual fighting. The Germans, whose aircraft were originally employed only for scouting purposes, were not slow in imitating them.

During all the recent Franco-British offensives, machines of all types were seen flying down as low as one hundred and even fifty yards above the enemy's terrain, raking the reserve lines with machine-gun fire, shooting down the gunners of exposed batteries, surprising reinforcements

on the march or coming up in troop trains, and spreading disorder everywhere.

In Artois, a moving train attacked by three British machines was wrecked with great loss to its crowded freight of infantry.

It is a pleasure for a Frenchman to pay to the British aviators the tribute well earned by their valour and enterprise. Sportsmen that they are, the English from the very first have taken to aviation as a sport, and have given themselves to it heart and soul. The results they have achieved are wonderful. They might perhaps have accomplished feats equally brilliant with smaller losses; nevertheless we cannot but admire the high courage of their young men, who, scorning death, have bent all their energies to achieve success.

The preceding brief summary of the uses of aviation in the present war justifies what we wrote at the beginning, viz., the side that has the uncontested supremacy in the air, the side that has done away with the adversary's aviation, will be very near the final victory.

But in order to safely and rapidly reach this result, the Americans should, in the organization of their flying corps, consent, at least in the

beginning, to make a sacrifice of their pride as inventors.

It will be absolutely necessary for them to commence the fight in the air with none but planes already successfully tested at the front in the various branches of the aërial service. It matters little what types they select from among the best now in use by the French, British, Italians, and even by the Germans; the important point is the achievement of swift and sure results, and these can be obtained only with such aircraft as have proved their worth in actual warfare.

Otherwise, the Americans would expose themselves, at the start, to the useless loss of numerous planes, and the sacrifice of many precious lives. They would delay for several months the perfection of an arm which is expected to give prompt and decisive results on the Western Front, and thus cause as great a disappointment to the American as to the Allied Armies.

The adoption of such a policy would not, however, prevent the American engineers from improving progressively upon their original aircraft. During the last three years airplanes have been continually modified and improved. Still greater improvements may be expected in the future,

and in this line a vast field remains open to the American genius.

**4. Hydroplanes.** A brief mention should be made of hydroplanes, or sea-planes, which, although usually equipped only with the pontoons that enable them to alight upon the water, are equally fitted for a landing on terra firma by the super-addition of wheels. Most of the British attacks upon the German airdromes, encampments, and fortified lines on or near the Belgian coast have been made from hydroplanes. These machines have proved of great value for patrolling the coast against submarines. The aviators can see the submarines at a certain depth under water, and following in pursuit, they attack them by dropping special bombs, which, like those used by destroyers when passing over a submarine, are so constructed as to explode at a certain depth by water pressure even if they do not strike their target. The force of the explosion is sufficient within a radius of many metres to disjoint the plates of the submarine.

**5. Balloons—Zeppelins.** At the outset of the war the Germans had a marked superiority in

dirigible balloons. They had then already completed their particular type of rigid dirigible balloon, the Zeppelin, which they have since improved and multiplied to the full extent of their ability. Only at sea have they used them for strictly military purposes, observing very advantageously by their means the British fleet and flotillas. In the fighting on the Western Front they have used their Zeppelins but once, in the course of their attempt upon Verdun, when an effort was made to destroy the Paris-Verdun railroad track. Two days before the attack they dispatched a couple of the great airships on this errand, but one was brought down and the other was driven away before they could accomplish their mission.

All the other Zeppelin expeditions on the Western Front have been made not against combatants but against towns. While they have caused a great many casualties among the civilian population in the Allied countries, a large number of them have been shot down.

France has used for distant expeditions a few non-rigid dirigibles and has lost several of them.

England, for the protection of the Irish sea and the Channel, uses some very swift little dirigibles



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which are very easily handled and form an excellent submarine patrol, but as fighting units they are worthless and are obliged to flee from hostile airplanes.

## CHAPTER III

### TRENCH ORGANIZATION

1. General remarks.
2. General plan of an intrenchment system. Trenches. First and second lines. Trenches of attack. Artillery. Wires.
3. Mines and counter-mines.
4. Special railway troops. Transportation by roads.
5. General remarks on transportation.
6. Camouflage.

**1. General Remarks.** When her dream of a short war which was to realize all her aims of conquest was dissipated, Germany resorted to a policy of occupation in the hope of either maintaining her hold upon the territory she had seized, or else of eventually using it as an asset in negotiations for peace. At the end of 1914 she occupied nearly the whole area of seven French Departments, three or four of which are among the richest agricultural and industrial districts of France.

To attain her ends, Germany intrenched her armies on the nearest front that she had time to

occupy, one of several defensive lines which she had selected long before. Her spies, in time of peace, had furnished her with accurate knowledge of all the important positions.

Thus, when the German armies of the first line were beaten on the Marne, and fell back in disorder, they found, at a distance of three or four days' march, beyond Soissons, on the frontier of Lorraine, an unbroken line of intrenchments already organized by the second-line troops while they were operating their enforced retreat.

The French pursuing armies had not, in September, 1914, the material means of assaulting the enemy's intrenchments. They had just fought a series of battles which had considerably lessened their effective forces. Their regiments had to be officered anew. They had no alternative but to intrench themselves, on positions as little disadvantageous as possible, in front of the enemy. Thus all along a line extending from the North Sea, at Nieuport, to the frontier of Switzerland, began the formidable conflict which is still raging.

The distance between the two hostile fronts varies from 30 or 40 metres to 1200 or 1500 metres at most.

After big attacks, prepared by long bombardments, the first lines cease to exist, and very often both of the hostile fronts are merged into one another. The most advanced small outposts have no other shelter than that of shell-craters, and it is by means of grenades thrown from one crater to another, and with whatever earthworks can be improvised with the tools on hand, that attempts to rectify the fronts are made.

Both parties, most of the time, have three successive lines of organized defence, and sometimes more.

It is to be noted, however, that while the Germans have adhered to the three-line principle in the sectors where they believe themselves but slightly threatened, on the fronts where they are heavily pressed by the Allied Armies, they have organized, as their advanced lines weakened or were forced, a series of very strong positions, one behind the other. It is impossible to be precise as to the number of these lines. According to the reports of the aviators, several complete systems of defences exist between the positions they are now defending and the Meuse.

It is interesting to remark that the multiplication of large-calibre artillery has caused changes

to be made by both belligerents in the construction of shelters and intrenchments.

During the winter of 1914-1915, no serious bombardments took place before April. Both sides organized themselves on their positions, excavating shallow shelters which were braced with wooden beams and roofed with two or three layers of logs, over which earth was more or less thickly packed. Such shelters resisted well enough 150 mm. shells.

But, in 1917, during the operations in Artois and Champagne, the adoption of larger calibres, and the use of torpedoes fired by trench machines, compelled the belligerents to bury themselves more deeply in the ground, wherever the soil permitted, and to build more solid shelters. When water interfered with deep excavations, the shelters were covered in with very strong T-shaped iron railway ties, or with several layers of steel rails; but these proved insufficient, and the Germans were the first to construct those bombproofs of reinforced concrete which the British for the first time encountered on the Somme. The concrete blocks are very large and the steel reinforcing bars extremely strong. Such works certainly impede and delay the operations of the



**Ailles and its western approach**

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enemy, especially when they are extensively employed, but events have proved that, given time, they can always be destroyed by gun-fire. The French have constructed similar works only at points of capital importance. They prefer the old wooden shelters, well reinforced with earth.

At all the inhabited places in their lines, and at points of natural strength, the Germans have organized independent centres of resistance. They have transformed whole villages into fortresses. Mention need only be made of the labyrinth of Carency-Thiepval, Beaumont-Hamel, the tunnels of Cornillet, of Hill 304, of Mort-Homme, etc.

In every one of those places a surprising number of concrete constructions and superimposed subterranean galleries were discovered. In them the enemy had collected reserve troops, food, and munitions. Such shelters, no doubt, afforded the Germans great protection, and in order to destroy them, it was necessary to have recourse to more and more powerful methods.

An officer of the 81st Regiment of Infantry which captured Mort-Homme writes as follows: " . . . and on the hill where the 81st Regiment is encamped, what an accumulation of defensive agencies! Wire, tunnels, trenches, observatories,



shelters of every description, machine-gun posts, light cannon, nothing is lacking. To these ordinary means of defence, other extraordinary ones had been added, consisting of three immense and very deep subterranean systems (82 steps led down to one and the length of another exceeded one kilometre) provided with ventilators, Decauville narrow-gauge railways, electricity, posts of command and relief, rooms for the men, and stores for food, arms, munitions, and material. All these extraordinary fortifications could not resist the impetuous assault of our troops, which had been preceded by a six-day bombardment so intense that the entire first line was enveloped in a thick cloud of smoke about two hundred metres high, and the ground shook all the time."

In fact, no absolutely impregnable shelter has yet been devised, and the story of fortification is but a repetition of the story of defensive naval armament. The thicker the plates of the dreadnoughts, the more powerful the guns are made, and the guns have the last word.

Moreover, it has been by no means demonstrated that the German intrenchments, which have cost enormous sums, and an amount of human labour that the Allies would have been

unable to furnish, have to any extent reduced the enemy's losses. On the contrary, it appears that the temporary protection afforded by such works is more than offset by the great losses in men and material which is the result of their final destruction.

The official reports which reach us, just before going to press, of the French victory of the 23d-25th of October, 1917, on the Aisne, prove that, in the captured salient (which the Germans had considered of capital importance), they had accumulated means of defence more considerable and powerful than at any point hitherto conquered.

At the inhabited points, they had converted all the cellars of the houses into bombproofs. They had bored tunnels of communication, some of which were a mile long. Everywhere they had built formidable concrete dugouts connected by covered passages loopholed for machine-guns, and had even mounted heavy pieces of artillery in their first lines. The whole position was considered so impregnable that they had stored in its subterranean spaces a very large quantity of winter supplies. The topography of the region was unusually favourable to the construc-

tion of defensive works, and a number of natural grottoes had been turned to good account.

In a few days a powerful artillery had enabled a heroic infantry (fighting under the eye of the American General Pershing) to overcome the resistance of an enemy defending his ground with a force of about nine divisions. This operation justifies once more our assertion that it is impossible to construct works that are absolutely impregnable to gun-fire.

To give an idea of the morale of the French, we can do no better than to cite a passage from a letter, written at the Front on October 6th, which we have just received from a young artillery officer. "Watch the communiqués that will be issued on or about the 20th day of October. We are preparing for the Boches a song and dance that they will not forget."

## **2. General plan of an intrenchment system.**

The description we give hereafter of the organization of the lines is, of course, like the following diagram, purely explanatory and illustrative.

It is intended to set forth the principles governing trench-construction and to give a general idea of a system of field fortifications. Such a system is



South-east of Ailes

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subject to the exigencies of local topography, and it is therefore impossible to state exact measurements and distances for the broad outlines of the plan.

Thus one could formulate no law to fix the distance which should separate the different lines of an intrenched position; and even with regard to the breadth of the interval between two trenches of the same line, one can scarcely be more precise; since, however essential it may be in theory to make it broad enough to prevent a single shell from doing damage to both trenches, in practice the configuration of the ground does not always permit of such a precaution.

The plotting-out of the trenches is of very great importance. They must be made in such a manner that they will not be exposed to an enfilading fire of the enemy's guns, and will be strong enough to oppose the greatest resistance to attack.

Too long and too straight lines are generally avoided. The usual custom is to reproduce the ground plan of a bastion, with alternating salients and re-entrants, a disposition which permits flank firing across the front of the trench (Fig. 1).

The re-entrants are frequently additionally fortified so as to render them insurmountable to

## 60 MAKING A MODERN ARMY

assault, so that the defenders need occupy the salients only. Advanced trenches exposed to intense bombardment can thus be defended with a smaller number of men.

The inside of the trenches is provided at short intervals with *pare-éclats*, or shell-screens, consist-



FIG. 1

ing of buttresses of earth supported by *clayonnages*, or wattle-work, which are intended to limit as much as possible the radius of action of a bursting shell to a single section of trench (Fig. 2).

The trenches are of different dimensions; nevertheless, when time is not limited for their construction, Fig. 3 can be considered as representing the most generally adopted type. The earth thrown up in front, either loose or filled into sand-bags, forms the parapet.

As the action of the weather, especially rain, tends to cave in the sides of the trenches, they have to be upheld with wooden props, or with

wire nets, supported at three or four metre intervals by wooden or iron posts.

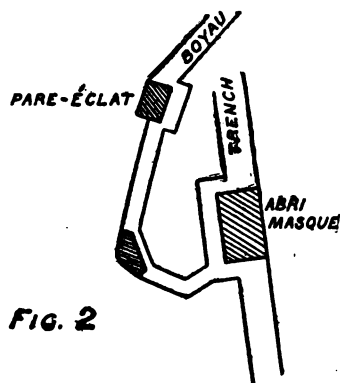


FIG. 2

In the very damp regions small drains (*rigoles*) and cesspools have to be dug to carry off the

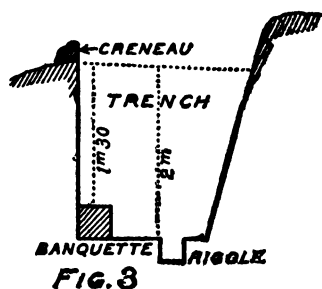
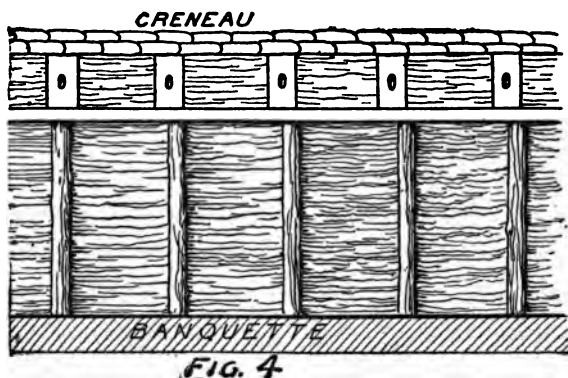


FIG. 3

water, and the trenches themselves must be provided with open "boardwalk" flooring. When



not pressed by time and scarcity of material, especially in winter, all possible means should be adopted to prevent the men from standing too long in water. Dampness, more than cold, is responsible for frostbitten limbs.



In the parapets of trenches that are expected to last some time, loopholes are made by inserting pieces of sheet-steel with openings to allow the passage of a gun barrel. Each opening closes with a small door which remains shut except when the loophole is in use (Fig. 4).

When neither time nor material is lacking, the machine-gun shelters (Fig. 5) in the trenches are installed within steel cupolas, which are either stationary or revolving. The mechanism of the

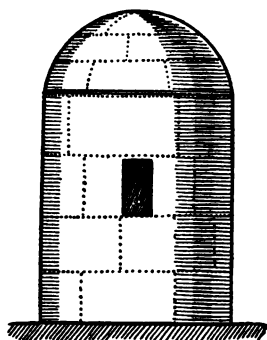


**South-east of La Bovelie Farm**

**February 10, 1917—2.30 P.M.**



latter is, however, complicated, and too delicate for use in the first lines. These cupolas are also much used for observation posts, and, as we shall see later, they are kept as much as possible concealed from the sight of the enemy by camouflage.



*FIG. 5*

The first line comprises three positions or trenches. That nearest to the enemy is the advanced trench, and at a short distance behind it are the support trenches. Only a few men are now posted as sentries in the advanced trenches. In front of these trenches, "listening" or "watch" posts are hidden in the ground. Between these posts and the advanced trenches barbed wire entanglements are stretched, in number and width proportionate to the dangers threatening the position.

## 64      MAKING A MODERN ARMY

In the support trenches are the dugouts sheltering the men against the fire of the artillery. Many communication trenches or *boyaux* connect them with the advanced trenches, facilitating the rapid occupation of the latter in case of need. In the advanced trenches are built shelters for the machine-guns. Rifle-fire is directed through loopholes protected by the steel plates above mentioned (Fig. 4) which are bullet-proof at fifty yards.

At some distance to the rear of the support trenches and overlooking them, the first-line system is reinforced by a line of "centres of resistance," which is punctuated with block-houses protected by thick wire entanglements. Well sheltered machine-guns, a certain number of which sweep the communication-ways leading to the front, compose their main armament. This blockhouse line is connected by many communication-ways with the trenches in front of it.

These centres of resistance are intended to check the advance of the enemy, when they succeed in breaking into the three anterior lines, and to give the reserves time for counter-attacking.

Between the blockhouses and the second-line system a fortified line is frequently organized

which is called the "protecting line of the artillery." This is intended to repel the advance of the enemy infantry, if they gain possession of the first-line system, before they reach the field batteries, or to retard it long enough to allow the batteries to fall back. This line is held by the troops of the sector which do not belong to the fighting contingent.

The distance from the first-line system of trenches to the second-line system varies according to the configuration of the ground. These second lines should, when possible, overlook the first lines, so as to hold them under their fire. The same rules prevail in the location of the third lines. In the sectors which seem to particularly interest the enemy, very strong "check positions" are prepared in the rear.

The troops occupying the second and third lines should be protected against bombardment as much as possible. It is therefore in these trenches or very near them that shelters capable of withstanding heavy gun-fire should be constructed.

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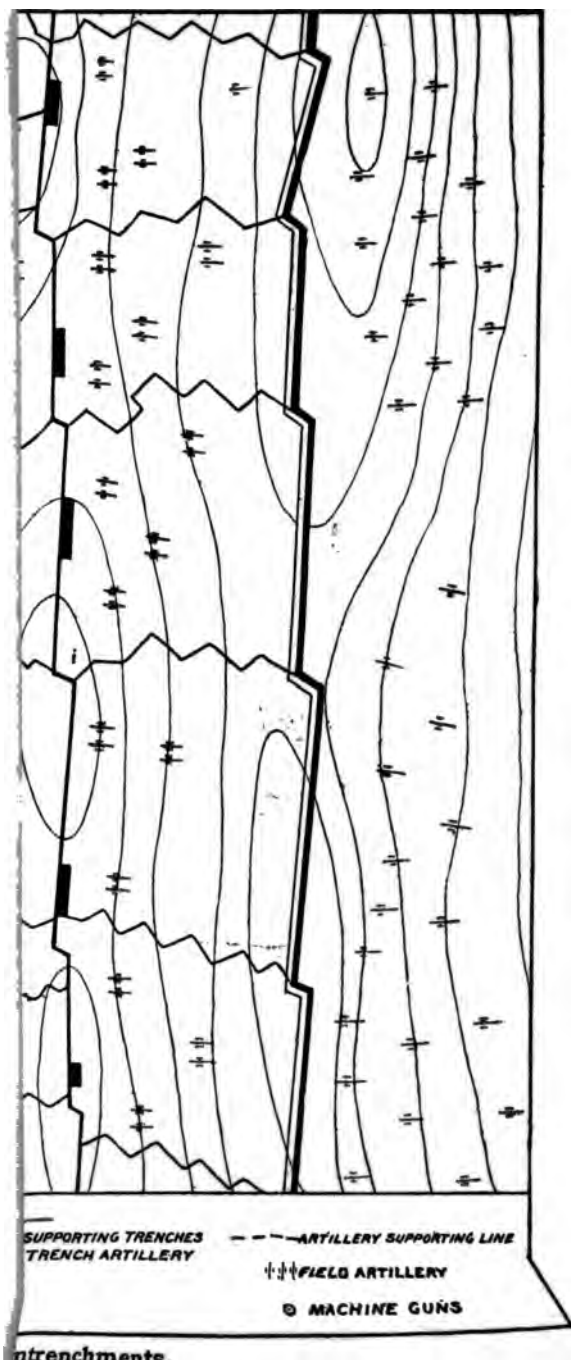
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The main point to emphasize is that these shelters should be connected by means of communication-ways permitting quick passage from the shelters to the trench-lines.

In all three lines, when the ground is suitable, observation posts are located, but however well they may be concealed, the enemy is not long in discovering them, and in the first line it is generally with the aid of different kinds of periscopes that the observations are made.

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The depth or breadth of these "ditches" depends on the use to be made of them. For





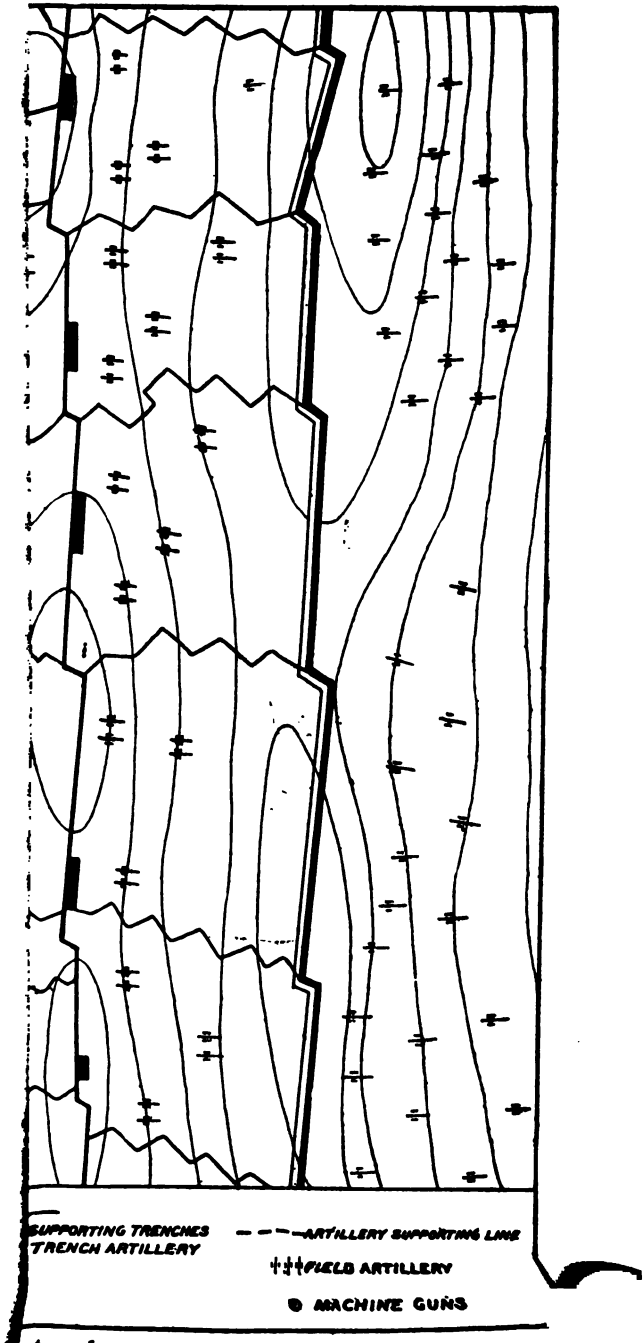
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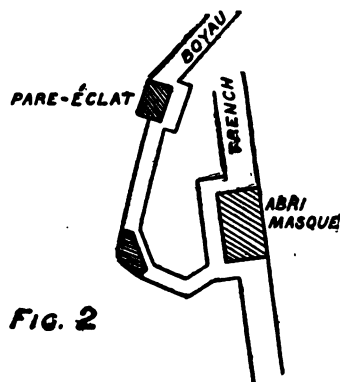


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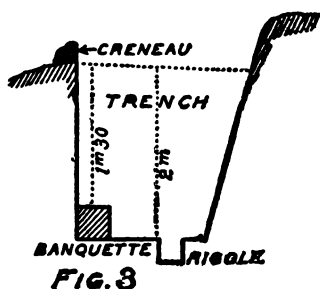
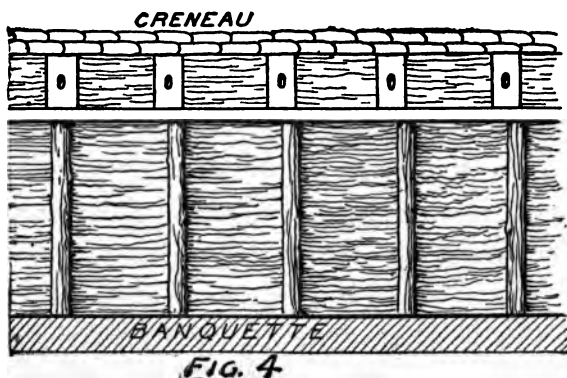


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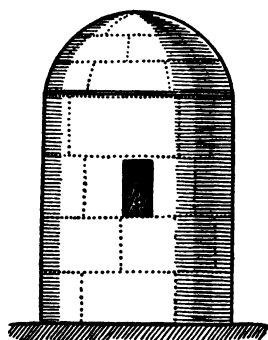


**South-east of La Bovelie Farm**

**February 10, 1917—2.30 P.M.**



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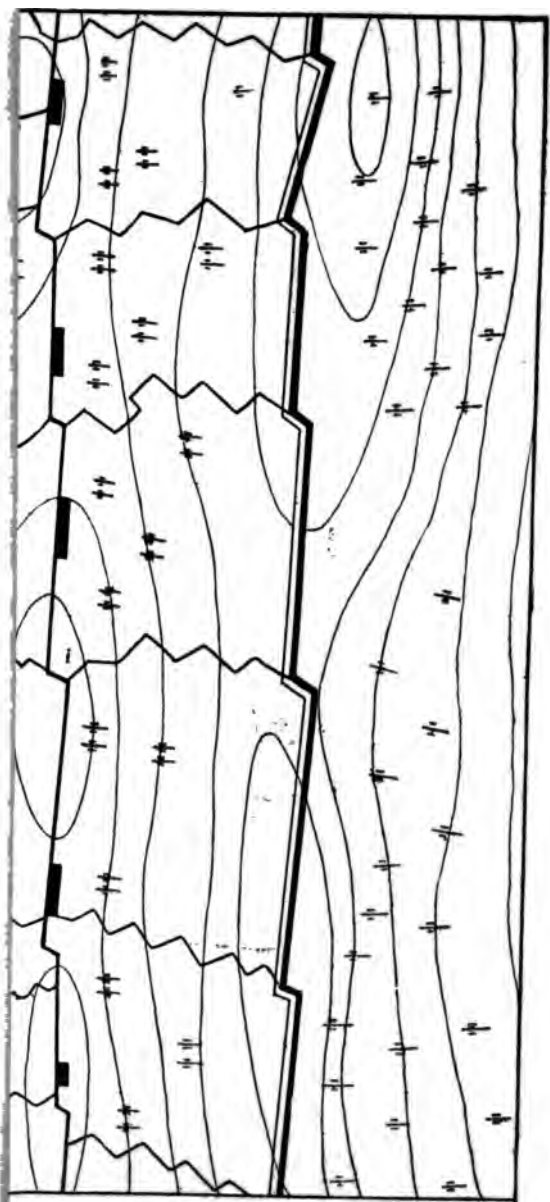
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The depth or breadth of these "ditches" depends on the use to be made of them. For



SUPPORTING TRENCHES  
TRENCH ARTILLERY

---ARTILLERY SUPPORTING LINE

⦿⦿⦿FIELD ARTILLERY

⦿ MACHINE GUNS

entrenchments

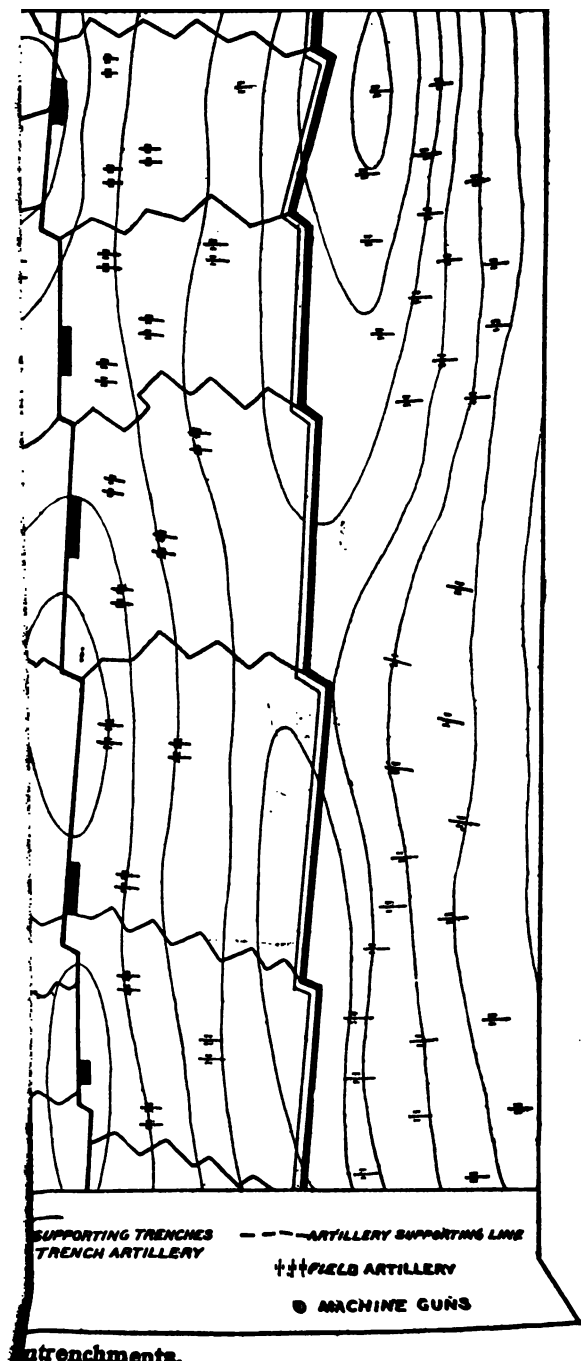
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instance, those intended for carrying out the wounded must be deep and wide.

To preclude obstruction during attack, and to provide free and quick passage for reserves rushing up from the rear, communication trenches should be very numerous. Some should be designated for forward and some for rearward movement. Each one should bear a name or a number and at its extremities arrows should indicate the direction of the circulation. Thus confusion will be avoided.

**TRENCHES OF ATTACK.** When the opposing lines are sufficiently far from one another, it is impossible to launch an attack without having brought the infantry within striking distance.

For this purpose a sufficient number of *boyaux* are dug in the direction of the enemy, starting from the advanced trenches, passing under the wire entanglements, and connecting together with a cross-trench when at the required distance. This is the "trench of attack" and at the proper time, steps are made in it to facilitate the egress of the troops at the moment of assault.

This work is done at night, and preferably, when possible, by troops which are not to take



part in the attack. The men proceed to this work under cover and patrol guard.

**ARTILLERY.** The artillery, according to its size, is placed between the lines or behind them. Field batteries are pushed forward up to the "artillery protecting line" and placed in position to shell, at any time, certain designated portions of the enemy's front. They are either buried in the ground or sheltered under casemates, when the latter can be concealed from the enemy.

The trench-guns are, generally, on account of their small range, placed in the first-line support trenches.

The heavy artillery, farthest back of all, is drawn up in echelons according to its size and the part assigned to each part of it.

**WIRE ENTANGLEMENTS.** The width of the wire entanglements varies considerably. Well-strung wire prevents any attack, and none can be attempted until the entanglements are destroyed. In front of their new lines on the Aisne, where the Germans are simply holding the ground, and have given up all notion of advance, they have stretched eight or nine successive rows of wire, each row being fifty metres wide.

Wherever defence only is contemplated, the

protection of wire is essential, but it will be well to bear in mind that too many entanglements may prove inconvenient at the time of an attack. We have seen that in such cases, the difficulty is solved by digging communication trenches under the wires.

**3. Mines and counter-mines.** Since both parties dug themselves in, much use has been made of mines and counter-mines, especially in 1915 and a part of 1916.

The aim of the mine is to throw the enemy into sudden consternation and disorder, while destroying an advanced trench, or work. The French considered the mine as a weapon with which it would be possible to remedy at certain points the defects of their line.

They caused heavy losses to both parties, but are not so much used now for the very good reason that, where the fronts have undergone no change since 1914, the soil has been so greatly disturbed that it would be absolutely impossible to make the necessary excavations. We shall simply recall that in June, 1917, the British, prior to their attack on Messines, set off twenty mines, each containing twenty-three thousand kilograms of

explosive, and as the Germans were not aware of their construction, the effect of the explosions was terrible, producing huge craters, seventy metres deep and several hundred metres in circumference.

Mines are dug by hand or electric drills. The latter have the disadvantage of making too much noise. Greatly improved systems of "listening posts" permit the enemy's operations to be detected and opposed, and in all cases, excepting at Messines, where the British bored their galleries at more than fifty metres underground, mine-digging was carried on under great difficulties.

The best means to neutralize the danger of a mine whose construction is discovered, is to reach it as quickly as possible by excavating a "counter-mine," and blow it up before the enemy has a chance to set it off. The success of such a counter-mine is termed a *camouflet* inflicted on the enemy.

In our opinion, mines and counter-mines will play a less and less important part in the present war, but it will nevertheless be necessary for our armies to be provided with the means of operating them whenever the Command may deem them advisable.

**4. Special railway troops.—Transportation by roads.** Since the beginning of the war, France has

been lacking in special technical corps, especially for the railways. Her ante-bellum system was insufficient to cope with the rapid development of the military operations, and the reorganization rendered necessary by trench-warfare along an extensive front.

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While the transport of troops alone requires a daily extension of our road and railway systems, and constant attention to repair-work in the fighting zones, the industrial efforts of the nation to equip and arm the millions of combatants also necessitates an enormous railroad activity. As the lack of workmen prevents locomotives and carriages from being repaired, and the supply of rolling-stock shipped from America is not sufficient, it is as much as the French can do to keep their railroad tracks in good condition.

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explosive, and as the Germans were not aware of their construction, the effect of the explosions was terrible, producing huge craters, seventy metres deep and several hundred metres in circumference.

Mines are dug by hand or electric drills. The latter have the disadvantage of making too much noise. Greatly improved systems of "listening posts" permit the enemy's operations to be detected and opposed, and in all cases, excepting at Messines, where the British bored their galleries at more than fifty metres underground, mine-digging was carried on under great difficulties.

The best means to neutralize the danger of a mine whose construction is discovered, is to reach it as quickly as possible by excavating a "counter-mine," and blow it up before the enemy has a chance to set it off. The success of such a counter-mine is termed a *camouflet* inflicted on the enemy.

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This short résumé of the conditions prevailing on the rear of the French Front will enable the Americans to comprehend the necessity for organizing on a very extensive scale a special railroad transportation corps. Without interfering with traffic on the principal roads of the United States, it should be possible to create railway regiments officered by civil engineers, with separate units for track-construction, operation of trains, and repair of rolling-stock.

The engineer regiments should likewise be enabled to build rapidly field-barracks of all kinds in the zones devastated and abandoned by the Germans.

They should, moreover, be entrusted with the erection of hospital and ambulance buildings, and their removal and reconstruction whenever new ground is wrested from the enemy.

TRANSPORTATION BY ROAD. Except in the immediate vicinity of the lines, where horses are still used by the regiments for transportation between the camps and cantonments and the bases of supply, all the conveyance of men and material, which is not made by rail, is done by motor-cars, in daily increasing numbers.

Not only have the railways from the rear to the front been increased in number, but also the communication lines running parallel with the front. Their capacity, however, being inadequate for moving large units quickly from one part of the Front to another, motor-cars should be on hand in number sufficient for the rapid transportation of an entire army corps.

There should be a permanent service of motor-cars between the front lines and the rear, to assume the task of taking fresh troops to the line and exhausted troops to the camping-grounds. They can be used also, and with great efficiency, when circumstances at the Front require the prompt advance of reserves from the various bases.

We shall see later how motor-cars are used for the supply of food or ammunition. Many more



cars are needed for the hospitals, ambulances, and the carrying of the wounded.

The consumption of gasoline, notwithstanding the suppression of the abuses which were for a long time prevalent on the Anglo-French Front, remains considerable. France is supplied with it exclusively by the United States and Mexico.

**5. General remarks on transportation.** The question of supplies of all sorts will be one of the difficulties connected with the organization of the American Armies on French soil. The United States will not merely have to convey troops from one continent to the other, but also to ship all that is necessary for the subsistence of her armies, their upkeep, their armament, their artillery, etc., just as if they were expected to land in a desert country where the barest necessities of life would be lacking.

The American Government and the General-in-Chief have from the start been aware of the difficulties awaiting them, and, immediately after the landing of the first troops, very important works were begun for the improvement of the French ports of landing and for the duplication of French railroads, wherever needed. This work is

being actively carried out under the direction of American engineers.

**6. Camouflage.** Everything pertaining to the equipment and employment of troops must be hidden, so far as possible, from the sight of enemy aviators, and the various devices resorted to for this purpose are termed "Camouflage" (disguise).

Artillery, transportation parks, ammunition dumps, camps, roads of communication, etc., are masked in many ways, on the general principle of causing the object to be concealed to blend with the tint of the soil or the foliage, or to melt into the landscape and avoid the eye. Coverings of brushwood or straw represent the simpler, and framework supporting artificial greenery or painted canvas, the more ambitious forms of camouflage. Objects irregularly blotched with paint of different colours are practically invisible at a certain distance—a device borrowed from the "protective colouring" of the animal kingdom.

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## CHAPTER IV

### COMPOSITION AND USE OF THE ARTILLERY

1. Retrospective view. General considerations.
2. Different sorts of artillery: Artillery of an Army; Artillery of an Army Corps; Artillery of a Division; Trench artillery "Tanks," or artillery of assault.
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#### 1. **Retrospective view.** *General considerations.*

In the French army long before the war, several clear-headed and well-informed men had foreseen the necessity of having a large, heavy field-artillery, similar to that of Germany.

To recall General Pétain's motto: "The artillery conquers the positions, the infantry occupies them"—this simple axiomatic statement obviously compels the inference that an army shall possess an artillery able to bombard efficiently every species of fortification.

part in the attack. The men proceed to this work under cover and patrol guard.

**ARTILLERY.** The artillery, according to its size, is placed between the lines or behind them. Field batteries are pushed forward up to the "artillery protecting line" and placed in position to shell, at any time, certain designated portions of the enemy's front. They are either buried in the ground or sheltered under casemates, when the latter can be concealed from the enemy.

The trench-guns are, generally, on account of their small range, placed in the first-line support trenches.

The heavy artillery, farthest back of all, is drawn up in echelons according to its size and the part assigned to each part of it.

**WIRE ENTANGLEMENTS.** The width of the wire entanglements varies considerably. Well-strung wire prevents any attack, and none can be attempted until the entanglements are destroyed. In front of their new lines on the Aisne, where the Germans are simply holding the ground, and have given up all notion of advance, they have stretched eight or nine successive rows of wire, each row being fifty metres wide.

Wherever defence only is contemplated, the

protection of wire is essential, but it will be well to bear in mind that too many entanglements may prove inconvenient at the time of an attack. We have seen that in such cases, the difficulty is solved by digging communication trenches under the wires.

**3. Mines and counter-mines.** Since both parties dug themselves in, much use has been made of mines and counter-mines, especially in 1915 and a part of 1916.

The aim of the mine is to throw the enemy into sudden consternation and disorder, while destroying an advanced trench, or work. The French considered the mine as a weapon with which it would be possible to remedy at certain points the defects of their line.

They caused heavy losses to both parties, but are not so much used now for the very good reason that, where the fronts have undergone no change since 1914, the soil has been so greatly disturbed that it would be absolutely impossible to make the necessary excavations. We shall simply recall that in June, 1917, the British, prior to their attack on Messines, set off twenty mines, each containing twenty-three thousand kilograms of

explosive, and as the Germans were not aware of their construction, the effect of the explosions was terrible, producing huge craters, seventy metres deep and several hundred metres in circumference.

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#### **1. Retrospective view. *General considerations.***

In the French army long before the war, several clear-headed and well-informed men had foreseen the necessity of having a large, heavy field-artillery, similar to that of Germany.

To recall General Pétain's motto: "The artillery conquers the positions, the infantry occupies them"—this simple axiomatic statement obviously compels the inference that an army shall possess an artillery able to bombard efficiently every species of fortification.

Unfortunately few people in the Government or parliamentary spheres could be brought to consider the possibility of a war; so this question of a heavy artillery, although continually agitated in those circles, remained unsolved.

In 1914, the immense majority of the French nation, including not only the politicians but also a great many army officers, scoffed at the possibility of a war with Germany. The Moroccan imbroglio, the war in the Balkans, and the Austrian policy of conquest were not sufficient warning for them. That France's military preparation was entirely inadequate, and that this was due solely to the lethargy of the national mind, is generally admitted to-day. During the first year of the war, not only were we hopelessly outclassed in heavy artillery, but at Lille, Maubeuge, and La Fère the Germans captured a goodly number of our heavy guns with their munitions, and turned them against us. Fortunately we are able to assert that they used them with very little advantage to themselves.

Only a few heavy-artillery regiments existed before the war. Their armament included few quick-firing 155 mm. Rimailho guns, which, though rapid in action, were too short in range. Other

batteries were armed with 120 and 155 mm. siege guns; good types, but too small in calibre, and too slow in action. Moreover all these guns were placed at the disposal of armies which, at the beginning of the conflict, considered them as a reserve stock and kept them too far from the battle-fields of August and September, 1914.

The impossibility of following up the victory of the Marne gradually opened the eyes of the Government to the need of a very large, heavy artillery, but this necessity was frankly admitted only in the autumn of 1915, and then largely under the influence of the example given by our British Allies. They had much more quickly comprehended that no victory would be possible unless supremacy in artillery was achieved, and, with their usual cold determination, had turned all the resources at their disposal to the manufacture of every kind of gun, and mountains of ammunition.

France followed the example.

The progress made enabled us first to hold our own against the German artillery, then to equal it, and finally to surpass it.

Considering the limited means left to France by the invasion, considering the seizure by the



enemy of her Lorraine iron deposits, and of her richest coal mines, it must be acknowledged that the effort made from 1915 to 1917 was gigantic.

**2. Different sorts of artillery.** We shall divide the artillery into three parts: the artillery of an army, of an army corps, and of a division.

**ARTILLERY OF AN ARMY.** This includes heavy artillery of all sizes. The army unit alone possesses guns of greater calibre than 155 mm. The composition of the heavy artillery in an army varies considerably, the number of different types of cannon allotted to any one arm depending upon circumstances and on the work which it is expected to do. According to local needs, therefore, the Generalissimo orders the heavy artillery to be transferred from one army group to another. Similarly, the Chief of a group of armies can, as he sees fit, order such transfers of guns within his command.

We find in the armies howitzers and mortars of the following sizes: 220, 270, 280, 305, 370, 400 mm. (in inches: 8, 10, 11, 12, 14½, and 15¾). Soon we shall have 520 mm. guns (20½ inches). There are also field guns of 120 and 155 mm. short and 155 mm. long (5 and 6 inches) and naval guns of 19, 100, 240, 274, 305, and 340 mm.

The artillery of an army is under the command of a General.

The field batteries of 120-155 mm. are composed of four pieces; howitzer batteries and naval batteries of 100 and 190 mm. are nearly always of two pieces. The largest mortars, and the heaviest naval guns mounted on railroad trucks, operate singly, and each gun is accompanied by several trucks carrying its material and munitions.

**ARTILLERY OF AN ARMY CORPS.** The artillery of an army corps is under the command of a Colonel. It includes two groups of 75 mm. field guns, two groups of 105 (4 inch), or of 120 (5 inch), and one group of 155 (6 inch), quick-firing. This artillery is reinforced, in case of need, by the heavy artillery which the army can dispose of. The Colonel commanding the artillery assumes the command of all batteries, of whatever size, momentarily put at the disposal of his army corps. He is most specially intrusted with the selection of the ground on which to place the batteries, and it is he who has to specify the part each of them shall take in the action. The divisional batteries of the army corps are also under his command, at least during the preparation for the attacks. It is absolutely indispensable that each battery

should be assigned its objective, and should be positively forbidden to scatter its projectiles promiscuously. Thus costly waste is avoided, and a definite purpose accomplished.

While getting ready for their first great attack in the Somme sector, the British, during an artillery preparation of several days' duration that exceeded in intensity any previously known, fired a vast number of projectiles. At the time of the assault, the British infantry displayed an indomitable courage, and captured several important positions, but, for the want of a proper concentration of the fire of their artillery on the points to be destroyed, their heavy losses in men were too big a price to pay for the gains they made. The British artillery has since modified its methods, and, assisted by an unexcelled service of aviation, it has, over all its Front, impressed the Germans with the power and accuracy of its guns.

ARTILLERY OF A DIVISION. At present, divisional artillery includes three groups of 75 mm. (each group composed of three batteries of four guns), one group of three batteries of four quick-firing 155 mm., and one battery of trench-guns, the number and size of which are variable. This artillery is under the command of a Colonel.

Further on we shall speak of the difficulty experienced in advancing the heavy guns through the country devastated by the Germans in March, 1917. The 75 mm. field artillery, only, was able to advance quickly enough. Guns of 105 mm. should have been able to follow the troops everywhere and give them help until the arrival of the heavier pieces.

In position, and at the time of active operations, the artillery of a division is reinforced by the artillery of the army corps and that of the army.

The longest range of field guns is 8500 metres.

The range of the howitzers varies between 10,000 and 14,000 metres.

Heavy guns have a much greater range. The 380 we shall soon be turning out will send a shell containing 150 kilograms of explosive to a distance of 38 kilometres.

**TRENCH ARTILLERY.** This artillery includes special mortars, firing at a high angle projectiles containing powerful explosives; their longest range is not over two miles. They are principally used for the destruction of wire entanglements, first-line trenches, and dugouts. Their size varies from 58 to 340 mm.

The projectiles are provided with blades which

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maintain their direction through the air, as the guns firing them are not rifled. They are really aërial torpedoes, and are tremendously destructive to trenches and defences of every sort.

The armies have a big reserve of trench guns distributed along the Front according to circumstances. These batteries are generally placed in the first-line support trenches.

Small-sized mortars operated by compressed air are now also used. Their range is limited, but for short distances they are very reliable and powerful weapons.

By reason of the great difficulties they experienced in getting heavy artillery up into the mountains the Italians have adopted trench mortars which fire very large projectiles to a considerable distance, and they have succeeded in constructing some examples which will throw heavy torpedoes three and four kilometres.

“TANKS” (ARTILLERY OF ASSAULT). Tanks were first used by the British, to whom they have rendered very valuable service. They have not only been of great assistance to their infantry, but have also produced a very depressing effect on the enemy's morale.

Their somewhat too great weight caused many

to stick in the muddy and unfavourable ground over which they had to operate. We believe that the original model has not been abandoned, but that lighter ones have lately been built.

The French made use of tanks for the first time in their attack on the Aisne on the 15th of April, 1917. Their machines were not absolutely perfect then, and, owing perhaps to faulty tactics, their success was not equal to expectation, but, in the attack of May 5th, they were better handled and proved valuable in the action. The French tanks have since been improved, and now thoroughly fulfil their purpose.

It is important to note that the Germans, who for a long time did not favour the adoption of tanks, probably because the management of these monsters require of their crews qualities not always found among the Boches, have recently constructed some. Of course they are of "Kolossal" proportions. We do not know as yet exactly what results they have obtained.

Quite recent reports reveal that in the attack of the 28th of October, north-east of Soissons, the French used tanks far lighter than those first employed. Last spring's experience has caused them to be handled in a much more efficient manner,

and the first reports show that these machines, by destroying numerous machine-gun shelters that had escaped the fire of the artillery, have greatly facilitated the forward march of the troops.

It seems to us that the proper tactics for tanks should not be to advance ahead of the infantry waves and thus, without benefiting them, hinder the barrage fire of their own artillery, but should consist in following slightly behind the first waves in order to complete the destruction of the numerous nests of German machine-guns which the artillery has not always succeeded in silencing, to overthrow obstacles, and flatten the incompletely destroyed wire.

In brief, the mission of the tanks should be to support the infantry and clear the way for its forward progress.

### **3. Mission and use of the artillery in the fight.**

The mission of the field artillery in the preparation for an offensive consists in tearing up the first-line trenches, the passages of communication, and the wire entanglements, and in locating and silencing the machine-guns through the loopholes of their shelters.

Unless the field artillery is directed with most

particular care, it is liable to expose its infantry to heavy losses, which are not only regrettable in themselves but affect considerably the morale of the troops.

For the very reason that the 75 mm. gun is a weapon of great precision, its accuracy is disturbed by very slight causes, such as atmospheric perturbations, and the quality and condition of the different powders. The officers commanding the batteries, immediately upon their arrival in new regions, prepare firing-tables based on the local conditions of the atmosphere and temperature, to guide the firing at the different hours of the day. They correct also the errors resulting from the different propulsive qualities of the various powders. As a rule all the projectiles belonging to the same lot give similar results.

Directly it is in position, the field artillery calculates the distance that separates it from the various points on which it may have to fire. It complies with all the requests of the infantry, when informed of dangerous moves of the enemy; executing rapid barrages on the signalled objectives. By barrages, at about one hundred metres ahead of the advance, it protects the assaulting waves of infantry. It increases the range in



proportion as the advance moves on. The groups of 105 mm. may be advantageously used in order to reinforce the action of the 75 mm. field artillery.

Since it has been possible to increase the proportion of 155 mm. quick-firing guns, batteries of this calibre have often been brought in to reinforce the barrages kept up by the 75 mm. guns. In the recent operations on the Anglo-French front this combination has often been used on a large scale, and with disastrous effect whenever fire was opened in time on troops assembled for the purpose of counter-attack.

Heavy artillery has a twofold part to play. It is an artillery for destruction and an artillery for counterfiring; it executes also neutralizing fire. It is guided by the information furnished by scouting airplanes and captive balloons.

*Destructive fire* is executed against important dugouts, blockhouses, shelters for machine-guns, and everything on the enemy's front that can check the advance of the infantry.

*Counterfiring*, guided by the same agencies, is executed in order to put enemy batteries out of action. It is certain, indeed, that the one of the two adversaries that succeeds in silencing the op-

posing artillery can more easily collect his forces, and, at the time of launching an attack or resisting a counter-attack, the task of the infantry will be made easier of accomplishment.

At the time of the preparation of the attacks, the fire of the various artilleries continues for seven and even eight days with unabating or even (if necessary) increasing intensity.

*Neutralization fire* is made with asphyxiating shells. When the enemy's batteries have been well pounded by destructive fire, the quickest way to put them completely out of action is to exhaust the gunners by neutralization fire and thus prevent them from serving the guns. Even with gas-proof masks the men very soon become exhausted on account of the difficulty they have in breathing through them. With this end in view, a bombardment with asphyxiating shells is kept up for several hours.

For instance, at the time of the attack, near Craonne, on the 5th of May, 1917, one of our French army corps was faced by about one hundred and eighty German batteries of all sizes. Our destructive fire had terribly damaged those batteries; but the Germans, being undisturbed on their Eastern Front, could bring up fresh bat-

teries at every moment, and were still able to oppose our advance towards the tableland of Craonne.

On the whole length of our Front our artillery fired with asphyxiating shells, and a few hours afterwards, with the exception of four or five, all the German batteries had ceased firing.

The importance of the use of asphyxiating shells may be very great.

Recently in Champagne an asphyxiating shell of large size penetrated through a hole made by previous heavy shell fire into a concreted German tunnel and exploded. This tunnel, which sheltered an important garrison, comprising two companies and many machine-guns, had already suffered heavily. Its exits were obstructed, but it was still holding out.

All but one man were suffocated, surprised by the gas before they had time to put on their masks. A French surgeon, peering through the hole made by the shell and seeing no sign of life, crept into the corpse-filled gallery, and, after a brief reconnoissance, signalled to the nearest French troops that they could occupy it.

It is not unusual to see, during the big attacks, the various artilleries established in eight and

even more rows, occupying all the available vantage ground.

The occupation of Hill 304 in August, 1917, is a striking example of the results of a thorough co-ordination of the different elements for the preparation of the attack and the capture of the position.

Commencing with the systematic destruction of the enemy's defences by several days' continuous bombardment, accompanied by a most careful location of his batteries, with the help of all possible means of investigation (such as wireless telegraphy, photography, location of the guns by light and sound, interception of code signals, interrogation of prisoners, etc.), the guns of our counter-batteries, having duly apportioned these various objectives, succeeded on the morning of the 24th in neutralizing the fire of the German artillery, and exhausting the defenders of Hill 304.

At the time of the attack our battle-planes, by driving the enemy's aircraft far beyond their lines, allowed our scout-planes to direct accurately the fire of our 75 mm. guns, and permitted the aircraft accompanying the assaulting waves of infantry to fly close to the ground and attack the enemy in their very trenches.

To such a co-ordination of all our efforts is due the seizure, with a minimum loss to our troops, of most important positions.

The Germans have a way of attempting to regain lost ground by counter-attacks in mass-formation, which has cost them terrible losses. Field artillery has a capital part to play in the repulse of these attacks, which are usually broken up by the rapidity and power of the barrages. The guns of 75 mm. are assisted by the groups of 105 and by the destruction groups of 155, and also by counter-battery or neutralization fire from the heavy artillery, according to the necessities of the moment.

**4. Anti-aircraft artillery.** Airplanes are the most reliable and effective weapons against airplanes and Zeppelins, but it is impossible to command at all times a sufficient number of machines to prevent the enemy's incursions.

Behind the lines have been placed special sections of anti-aircraft guns of different sizes (75, 47, and 37 mm.) mounted on special carriages that allow vertical fire. Without entering into details, we may say that the fire of these guns has been rendered so accurate that, though every airplane

thus attacked may not be destroyed, projectiles shower so close around them that they are forced to fly away at all speed. A certain number of aircraft are brought down by these guns every month.

One of these sections hit and brought down a Zeppelin near Verdun in February, 1916; another shot down, near Compiègne, in the spring of 1917, a large Zeppelin on its way back from England. Quite recently five Zeppelins returning from a raid on London were brought down in France by airplanes and anti-aircraft cannon. We mention these well-known events as indicating the unquestionable superiority of the airplane over the dirigible, which, we repeat, has been of real military service only at sea. They also demonstrate that by increasing the number of anti-aircraft sections both behind the front and in proximity to the whole enemy line, the raids on open towns can be rendered impossible.

The Germans have recently invented a new gun, probably a mortar, which projects with great accuracy and to a high altitude a big cluster of whirling balls of fire, each having a potential diameter of five or six feet of fire. The whole cluster has an apparent radius about as great

as the spread of an airplane from tip to tip. These new projectiles, known as "flaming onions," have been used principally on the British Front, and do not appear to have done much actual damage, but should a great number of them be discharged at large, slow-moving planes, they might become dangerous.

**ARMoured MOTOR-CARS.** On some armoured motor-cars small cannon are used; on others, machine-guns are placed. They are intended to throw the enemy lines into confusion at certain points. Their action must be swift, sudden, and brief. Their mobility enables them to dodge the fire of the enemy's artillery. These cars can be much more useful in open field operations than in trench warfare. They will be especially useful as a help to cavalry when the latter can once more be used.

Every regiment of infantry is now provided with a section of three 37 mm. guns which being light, easy to move, and very accurate are employed principally, either all together or in the proportion of one to each battalion, against machine-guns. They have been greatly appreciated by the regiment commanders; a large number will probably be distributed as soon as they can be manufactured.

5. **Advance or withdrawal of the artillery.** One of the most interesting questions for an army in the making, such as the American Army, is that of the rapid moving of the heavy artillery, at a given moment.

We do not hesitate to say that this problem is far from being entirely solved on the Western Front, and that its study and organization will be a very hard task for the engineers entrusted with its solution.

American engineers will have to go to the Western Front and see for themselves all the difficulties to be surmounted.

ADVANCE. During the spring of 1917, the French Army had to pursue on a large front an enemy who had not only devastated the country behind them to a depth of from 30 to 35 kilometres, but had also accumulated in this wilderness all the obstacles their fertile imagination could suggest.

The 75 mm. field artillery alone, at the cost of great efforts and tremendous loss of horses, managed to overtake, though somewhat late, the advance of our infantry, which had succeeded in going forward everywhere.

The sections for the supply of munitions fol-

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lowed their batteries, but more slowly; and some batteries, which at the cost of great and continuous efforts, had come into position, had no munitions.

The only way to guard against such delays, in the future, will be to keep in reserve complementary teams of horses, to replace those that are killed, or to help the batteries and their ammunition sections through the worst passages.

We have not the right to give here in detail the difficulties encountered in the advance of the heavy artillery. We were informed of them by a confidential note from the High Command.

However, while this confidential note sets forth in detail all the difficulties encountered, it makes no recommendation whatever as to what should be done on such occasions in the future.

There is absolutely no doubt that wherever the Germans retreat, they will endeavour to accumulate obstacles behind them as they did on the Somme and the Aisne. The question of the advance of the different artilleries must therefore be very carefully considered. Means must be found to ensure it, while keeping within the immediate reach of each battery the requisite munition supply.

America, however great her participation in the

war, will never be able to mobilize more than a small part of her immense population. Unlike France, she will not be forced to suspend the activities of ordinary industrial and commercial life. Assisted by technicians, she will succeed in training all the special troops required and in supplying them fully with material. She will even be able to lend some of them to France, who, having mobilized all her fencible men for service at the front or rear, experiences great difficulty in recruiting the technical troops she needs.

The problem of the rapid advance of the artillery is to be solved by increasing the road-making facilities. Whatever the difficulties encountered and the obstacles created by the enemy, we must be able to make, with the least possible loss of time, large and solid roads in sufficient number, and to repair or build entirely new lines of railroads of all gauges.

WITHDRAWAL. We must always foresee the possibility of a defeat, prepare everything to lessen it, and leave as few guns as possible in the hands of the enemy. This problem is easier to solve than that of an advance towards the enemy, and in order to be able to withdraw the various artilleries rapidly, it will be sufficient,

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when preparing the attack, to have foreseen the number of roads and tracks necessary to remove the batteries from the front.

These roads and railway lines have to be constantly kept in order by special gangs, and the holes made by shells must be immediately filled up.

In fact we shall see that the perfect repair of all these ways of communication is intimately connected with the supply of munitions.

**6. Conclusion.** From the mere general outlines we have just given concerning the use and mission of the artillery, we may draw the following conclusion:

Till the end of the war it will be necessary to constantly increase the manufacture of guns of all sizes, especially those of the largest calibres, and to accumulate a reserve of ammunition far beyond the actual needs. The adversary that will have succeeded in silencing the opposing artillery will be sure of victory, and will obtain it without the enormous losses in human life that all combatants have sustained since the beginning of the war.

These losses, it may be remarked in passing, have been considerably reduced of late by the employment of more scientific methods of fighting.

The transference of heavy artillery from one army to another, according to local needs, has many disadvantages. Such a practice prevents the High Command from deceiving the adversary as to the real point of attack. If the artillery preparation could be maintained with equal intensity for equal periods of time on the Fronts of several armies, the enemy could not possibly foresee which of the armies would strike the principal blow, and would be much embarrassed as to the disposition of their reserves.

It will never be possible on a 600 kilometre front to accumulate a sufficient number of guns literally to accomplish this, but by constantly turning out new guns, by increasing the number of batteries and of large artillery concentrations on many points distant from one other, the enemy will be kept guessing.

## CHAPTER V

### MUNITION SUPPLY

1. Sketch of the railroad organization.
2. Organization of the munition parks.
3. Divisional parks. Their organization. Their management.
4. Importance of the munition supply.
5. Replacement and repair of guns.
6. Different issues of ammunition.

In the present war the supply of munitions of all kinds is of such great importance that we have thought proper to devote a special chapter to this subject.

**1. Sketch of the railroad organization.** According to instructions from General Headquarters the services at the rear forward the required ammunition to the "distributing stations" of the different armies. There is one of these for each army, provided with the necessary sidings and yards where all the men and materials coming from the rear are sorted, and distributed further ahead throughout the "terminal zone" (*zone*

*d'étapes*) or "war zone." This zone extends from the distributing station to the front of the army it supplies. The stations within the zone at the rail-heads, just behind the front, are the "war terminals" (*stations têtes d'étapes de guerre*).

From this brief sketch of the railroad organization that feeds the front, we pass to a consideration of the war-freight which it carries.

**2. Organization of the munition parks.** At the rear of every army there is a "Main Artillery Park," located at a point of easy communication with the distributing station and the front beyond. Military railways connect it with the "Army-Park Depots" farther on, which in turn are similarly connected with the "Army-Corps Parks," and the latter with "Divisional Parks." The military railways thus spread out fan-wise from the various bases to the front, through distributing-point after distributing-point.

During the transportation of the munitions from the interior of the country to the front, the different kinds of projectiles are never mixed together. There are munition trains for heavy guns, others for field guns.

The munitions are transported by rail in the



following way. The 75 and 105 shells travel in wooden cases, from which they are removed only to be placed in the supply wagons that carry them directly to the batteries.

The shells for the big guns are transported in bulk. They are filled with explosive, but the fulminate is not attached.

The powder lots for all sizes travel in *copper* cases, to guard against all risks of accidental explosion. The distributing station sends the ammunition trains to the Main Parks, where they are shunted on to sidings.

These trains are afterwards distributed to the advance posts of the Army Parks, where, according to circumstances, they are unloaded to form reserves of munitions, or redistributed to the Army-Corps Parks.

Most of the time, when the parks of the front are demanding fresh supplies, those trains are not unloaded at the Army Parks, but sent on to the Army-Corps Parks.

There, the ammunition is taken off the cars, and piled in assorted stacks separated by intervals of fifty metres; stacks of cases for the field artillery, stacks of big shells, stacks of fulminate cases, and stacks of powder-bag cases.

The Army-Corps Parks are entrusted with the supply of the Divisional Parks, with which they are connected by small railways of 60-centimetre gauge.

**3. Divisional parks.** As we have taken the division as a unit and examined its component parts, we shall likewise take the Divisional Park as a type.

It has complete autonomy, and has the means of distributing munitions for the artillery and the infantry to the batteries and regiments of the division. It possesses, too, reserve guns, and has the equipment necessary for repairing wheels, wagons, gun-carriages, brakes, motor-cars, etc.

Let us examine the part taken by a Divisional Park in the preparation of an action.

As it is continually supplied by the Army-Corps Park, its duty is the maintenance of a sufficient reserve for the batteries and regiments of the division. The reserve should be complete when a battle is about to begin.

Field artillery and infantry should be supplied with munitions by wagon-trains. In fact, as soon as the soil has been badly ploughed by shells, only horse-drawn vehicles can circulate.

The frequent necessity of planting new batteries has been the cause of a considerable reduction in the number of the wagon-trains. They have been replaced by motor-cars that drive as near the batteries as possible. The latter then send their wagons to meet the motor-cars and bring the shells to the points selected by the officer commanding the batteries.

The ammunition for the heavy artillery is brought on railways of 60-centimetre gauge to the battery supply-shelters, whence 40-centimetre gauge tracks, equipped with small hand-trucks specially detailed to each battery, take it directly to the guns. These supply-shelters, solid enough to resist the enemy's shell-fire, are constructed by each battery as soon as it has completed and occupied its allotted emplacement.

During the preparation the transportation of supplies offers few difficulties so long as the fire of the enemy is not very severe. As soon as the ground begins to be torn up, construction-gangs must be summoned for the purpose of keeping in repair all the ways of communication. Each battery has its own organized reserve of munitions or supply-shelter, from which to draw the necessary shells during the first days of the operation,

and the parks endeavour by all possible means to keep on feeding these reserves.

Ammunition for the trench-guns is conveyed to the entrance of the trenches by similar little hand-operated railways, and cartridges and grenades for the infantry are distributed in the same manner.

It is advisable, when time and means permit, to operate these small railways of 40-centimetre gauge in the trenches themselves, when they are sufficiently wide for the purpose. The small trucks, pushed by men, will bring the torpedoes and other munitions as far as possible, but when the narrowness of the excavations prevents this, supplies must be carried by hand to the most advanced lines. This work, which is very laborious, should be left, whenever possible, to men drawn from regiments in the rear which are not intended to take part in the impending attack. For the last year North African burros have been used for carrying the munitions through the communication trenches. They are hardy animals, easy to drive, and they save the troops a great deal of labour.

**4. Importance of the munition supply.** To give our readers an idea of the enormous work in-

volved in munition transportation, we append some figures obtained from a field battery operating in the first lines on the Aisne in March and April, 1917.

On the 12th of April the reserve in munitions of that four-gun battery was 2000 shells per gun; *i. e.*, 8000. From the 15th onward the battery received 1500 shells daily. On the 19th, in the evening, there remained only 1700 shells. The battery had therefore fired from the 12th to the 19th about 3600 shells per gun. This is a normal figure, and explains why millions of shells are fired on a large front in a few hours.

**PRECAUTIONS.** The enormous quantity of projectiles and supplies of all kinds in the different parks prevents them from being sheltered or even concealed, and, in order to limit the accidents caused by explosions, the stacks of ammunition are far from one another. In an effort to hide them from the enemy aviation, painted cloths, or green or brown coloured grasses, are thrown over them, so as to deceive the eye.

For some reason or other the aviation of the enemy has not caused very great damage to our various ammunition stores. The damage, as a rule, has been confined to the explosion of the

stacks directly hit, although, at the beginning of the operations on the Somme, a German aviator succeeded in destroying completely in the rear of the English lines a large park of all sorts and sizes of shells.

The Allies also have often caused the explosion of German munition depots, but the damage done, to all appearances, has always been limited.

**5. Replacing the guns.** We have just seen that some field guns fire as many as 3600 shots in a few days. This, added to the rapidity of the firing (at times fifteen shots a minute, during barrages), explains the rapid wear of the guns, whose metal becomes decomposed by the heat.

In spite of the quality of the steel, the guns wear out and finally burst. It is of the utmost importance to replace those put out of service by wear, or by the fire of the enemy.

This duty rests with the Divisional Park, which must have a reserve sufficient for all needs. The park must also be prepared to repair all the guns which are not so badly injured as to require shipment back to the Army Park.

The battery to whose consumption of munitions we have previously referred had, from the

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12th to the 19th of April, to make the following changes:

Two guns were put out of service by the fire of the enemy;

One gun exploded;

Seven guns had to be sent to the parks for repairs to their mechanism or their carriages, which had been put out of service.

When the mechanism, the wheels, or a part of the carriage only have been damaged, repair is rapidly made, but when the guns have exploded or have been smashed by the enemy's fire, they have to be recast.

In short, a battery of four guns, used ten guns in seven days; but it should be noted that out of these ten guns only three were entirely put out of service (two of the carriages could be used again) and two of the guns merely needed a change of tubes.

Nevertheless, these figures emphasize the need for the parks to keep on hand a large stock of reserve guns and to maintain workshops for the immediate repair of slightly damaged pieces.

The retubing of the guns is a work that can only be done in the factories of the army. The interior rifled tube, while white-heated, is removed

and replaced by a new tube which is re-rifled. The gun is then as good as new, but, if the outside tube, which is the resisting part of the cannon, has been broken by projectiles, the gun is beyond repairing and has to be sent to the rear to be recast.

Under the most severe bombardment the replacement of the guns, thus put out of service, did not take more than two hours.

The study of the above details will show the necessity, in case intense and constant firing is needed, of accumulating the largest possible reserve of field batteries at the points requiring a great effort. When, as will often happen, several batteries are temporarily out of action, the surrounding batteries will have to intensify their fire. Barrage fires, almost exclusively the work of the field artillery, must be rapid, continuous, accurate, and concentrated.

**6. Different issues of ammunition.** In order to avoid delay in the aiming and firing, it is indispensable to see that the ammunition brought to the batteries, of all sizes, belongs, as much as possible, to the same issue, from the same loading factories. This rule is strictly adhered to, except in case of material impossibility.



In France, parks generally receive lots of 5000 shells, all loaded in the same factory and with labels enabling the gunners to ascertain that the projectiles belong to the same lot; loaded at a specified date and at a specified factory.

After a few trial shots, the battery commanders will see the effects of a given lot of shells and point their guns accordingly.

We cannot enter here into the details of artillery practice. The study of it must be begun in schools under the direction of specialists; practical application must be made in the camps. This detailed instruction is now being given in the camps of France and America to the new recruits by Allied officers, who all have acquired at the Front a large experience in all that concerns the artillery.

Guns play a preponderating part in the present war, and the combatants are improving them unceasingly.

At the present time, the French field artillery undoubtedly stands first for the accuracy and efficiency of its guns and projectiles, the models of which have been adopted by the United States.

The French and English heavy artilleries are now decidedly and in every respect superior in

quality to the German and are more cleverly handled.

The English heavy artillery, at all times seconded by numerous aviators of great daring, can develop its concentration fires to a very great degree of intensity and efficiency, and we can assert on personal information that there never has been on any front during this war such a formidable drumfire as that executed by the French artillery between the 18th and 22d days of October, 1917, north-east of Soissons.

The Germans, who at the beginning of the war were rather bad gunners, have improved their material and especially their firing methods by frankly adopting those of the French artillery. They possess a heavy artillery, as numerous as powerful and varied, and when they succeed in systematizing their fire, its effects are cruel.

For this reason we shall end this chapter by repeating:

Let us have still more cannon, still more ammunition, and still more airplanes to second our artillery.

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## CHAPTER VI

### INFANTRY

1. Arms of the infantry: the rifle; the machine-gun; the machine-gun rifle; the bayonet; the grenade; the trench knife; the automatic pistol.
2. Instruction of troops. Duties of officers. "Shock-troops."
3. The infantry of a division: the front; dispositions taken; storming troops; occupying troops; offensive or defensive engagements; preparation of attacks; prolonged engagements; posts of command; signalling; battalions and companies; subaltern staffs.
4. A word about cavalry.

**1. Arms of the infantry.** This war has completely transformed the armament and consequently altered the fighting methods of the infantry.

**RIFLE.** In 1914 the French soldier was armed with the rifle of the 1886 pattern, not remodelled; *i. e.*, a repeating gun with a hand-filled magazine. It was an excellent weapon in use for a long time, but too many of them had lost their accuracy through wear. Since 1914 these rifles have been

replaced by others of the same model fitted with loading clips.

**MACHINE-GUNS.** At the beginning, the number of machine-guns was six per infantry regiment. During a long time they were distributed at the rate of two per battalion; then it was decided to form them into a battery under the command of the Colonel.

This limit of six machine-guns per regiment placed France in a very great inferiority to the Germans, who had reserves of machine-gun companies in every division.

The first battles showed the important part played by the machine-guns, and France prepared to turn out quantities of them. For a long time, however, she remained in a state of inferiority in this respect, by reason of the advances in equipment made by the Germans, and also because, out of the three different models adopted and constructed, two were not strong enough to stand trench warfare. These models gave disappointing results, but the evil has now been remedied.

Each machine-gun company is now provided with sixteen guns—a number which, we believe, has been adopted for the machine-gun company in America. As France now possesses excellent

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models, the United States troops, who already before the war had good guns, will doubtless receive an efficient equipment. In this war, it is necessary that the component parts of a machine-gun and its ammunition should be easy of transport.

Notwithstanding their reduced effectives, the Germans are still able to increase the number of their machine-guns, and they contemplate raising their number from twenty-four to thirty-four per company. In all likelihood the Allies will very soon have to strengthen their own machine-gun batteries. A battery can seldom fire all its guns at the same time because they get too hot after shooting about five hundred rounds, and because they are likely, especially when operating over muddy ground, to get jammed, and thus remain out of service until the gunners can put them in working order.

For these reasons the ante-bellum regulations prescribed that machine-guns should work in pairs, so that one would always be ready to take up the fire, if the other should, for any reason, go out of action.

This regulation is still adhered to, but only so far as circumstances permit. In cases of emer-

gency, for instance, when an attack has to be repulsed, the simultaneous use of all the guns becomes necessary, especially against an enemy who possesses a superior number of similar guns.

Each belligerent has captured many machine-guns and much ammunition from the enemy. Thus France has complete German batteries, and Germany possesses both French and English batteries.

The principal structural difference between the German and French machine-guns consists in the mechanism for cooling off the guns; the Germans use for this purpose water circulation, and the French air circulation.

To avoid serious burns resulting from contact with the barrels of the guns, the gunners wear gloves covered with very thick steel mail.

We have seen photographs of American machine-gun batteries carried on motorcycles. The French no longer make use of this method, and although it may have proven excellent in Mexico, it is entirely impracticable on the French Front.

The ground for a long distance behind the lines of defence has been so torn up and rendered impassable by prolonged bombardment that motor vehicles cannot get through. Horse-drawn



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vehicles can approach much nearer but at the entrance of the communication trenches even pack transport has to be abandoned, and from this point (in default of such recent devices as narrow-gauge hand-operated tracks, or pack-donkeys) all war material has to go forward to the advance lines on men's backs. In case of an advance beyond the front, difficulties would be doubled, since the devastated ground behind the enemy's lines would have to be traversed.

Pack transport therefore is best suited for machine-gun batteries and their supplies. Where the number of horses or mules is insufficient, light vehicles, each drawn by a single animal, can be used; especially for the machine-gun sections which are to occupy more or less permanent positions.

In order to counterbalance her losses, Germany has constantly increased the number of her machine-guns, using them as a defensive weapon to check the advance of the enemy, and to enable herself to cling to her positions with a small number of men.

Germany does not hesitate to sacrifice machine-guns in order to gain time, and German machine-gunners were often found in their shelters chained

to their guns, and so obliged to serve them until killed or released by the enemy.

Machine-guns and grenades are certainly the most powerful arms against assaulting waves. Seldom will the reconnoitring airplanes detect all the numerous machine-gun shelters. Some of them always remain after a bombardment to show activity at the time of the infantry attack.

The British have very efficiently used their tanks for the destruction of these remaining machine-gun posts. The French have commenced to use them advantageously. The Americans, entering the war after they have been perfected, and profiting by their Allies' experience, will be able, on their arrival at the front, to use well designed and constructed tanks in support of their infantry. Tanks will become more and more indispensable weapons, and their general use will save the infantry heavy losses of life. The Germans now have some.

**MACHINE-GUN RIFLE.** A new weapon was added to the armament of the infantry in 1916. It is the machine-gun rifle, which is not to be confounded with the automatic rifle (repeating rifle).

Much lighter than the machine-gun, carried

and served by one man only, it is easily moved about, and, when well used, is a most dangerous weapon.

To shoot, the man lies down (behind a shelter if possible) and lifts the butt-end to his shoulder, the fore-part of the gun resting on a very short fork. Machine-gun rifles are used principally against machine-guns.

There are several types of machine-gun rifles. The best is without doubt that provided with a plate, containing twenty-five cartridges, which turns on a vertical axis back of the gun and fires the twenty-five cartridges. Each shot causes the plate to make  $\frac{1}{6}$  part of a revolution and drop a new cartridge in the barrel. When the plate is empty it is immediately removed and replaced by another that has been previously loaded.

Experience shows that machine-gun rifles give good results only when in the hands of cool and clear-sighted men, well acquainted with their manipulation, but that they are not as good as the ordinary rifles in the hands of African troops.

**THE BAYONET.** All the infantry use the bayonet, a weapon which has maintained its full importance in the present war. French and Russian



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January 29, 1957—12.30 P.M.



soldiers handle the bayonet most dangerously. The Germans are not so proficient in its use.

The men must be given a very detailed and thorough instruction in bayonet practice, but as the American troops are in possession of a very complete manual on this subject we will not dwell upon it.

**GRENADES.** A new weapon (or rather an old one that has been revived) that plays a very important part in the actions of the infantry is the grenade. Many types exist but they can be classified either as offensive or defensive grenades. The former kind is not so destructive as the latter. They are lighter, can be thrown to a greater distance, and are used to prevent the enemy from coming out of their dugouts and trenches when the assailants reach them. The defensive grenades, which are extremely destructive, are used against attacking or counter-attacking troops. Some are thrown by hand, others with the rifle. Well trained soldiers can throw grenades as far as fifty and fifty-five metres.

Rifle grenades are thrown by the propulsive power of the ordinary cartridge. A special contrivance at the muzzle of the gun cocks the grenade, so to speak, as it is driven from the



barrel by the bullet, so that it will explode on hitting the ground. It reaches farther than the hand grenade.

Recently General Pershing rightly laid stress on the necessity of perfecting the marksmanship of the recruits. To this accomplishment and skill in the use of the bayonet, which gives the soldier self-reliance, suppleness, and agility (qualities that the Germans do not easily acquire) ought to be added a thorough training in the throwing of grenades, a sport which promptly captivates those who practise it. Excellent results are secured by offering prizes for grenade practice, both for distance and marksmanship. The French soldier is contented with little, and the mere offer of a few cigars or packages of cigarettes to the best throwers has achieved wonderful performances in this line.

We believe that the Germans have no reason to congratulate themselves on having been the first to reintroduce the use of grenades in warfare, because it is a weapon requiring intelligence and skill in its handling. Thrown by shrewd quick Frenchmen, or by sportsmen like the British, it is much more dangerous than in the hands of thick-headed, passive German soldiers. We are sure

that the American troops will use the grenade with the same skill as their Allies.

**TRENCH KNIVES.** The trench-fight is a fight to a finish, and has necessitated the adoption of a strong knife. In the hands of fierce resolute men it is a terrible weapon, much resorted to in the confined space of trenches, tunnels, and dugouts where bayonets cannot be used. The African troops are very fond of these knives, and as the Germans are well aware of this fact, they never surrender to African troops, and the fights between these combatants always smack of savagery.

On account of their fear of knives and daggers the Germans have pronounced their use inhuman, and have shot many prisoners on whom daggers were found. It is advisable, then, for troops obliged to surrender (and the bravest troops may have to do so) to throw their daggers away in good time.

**AUTOMATIC PISTOLS.** Officers and non-commissioned officers only have automatics, but we would like to see them issued to the infantry, as they *are most useful in hand-to-hand fights*.

The use of the various arms above named has necessitated the division of the company into grenadiers, machine-gunners, and light infantry.

The last-named fight especially with the ordinary rifles, bayonets, and daggers.

When circumstances permit, it would be advisable to teach all the men of a company the use of all the arms, one after the other, so as to be able to re-establish after and even during a battle the exact proportion of specialists. There has been too great a tendency to neglect rifle practice. Soldiers ought to lose no occasion to perfect themselves in the use of the rifle, which remains the principal arm of the infantry. Its importance will be even greater in open warfare.

**2. Instruction.** To be a good infantry soldier a man ought to be very vigorous, sufficiently young, not more than thirty-five, well fed and well trained.

The individual instruction should be as thorough as possible, and perfected before the man is sent to the front.

The theoretical instruction of troops must be completed before they can be given the defence of a sector, and it is only in the lines and in the face of the enemy that they can acquire the practical experience. The more thorough their knowledge of theoretical details the sooner the company and battalion will become good fighting units.



**La Bovelie**

**December 20, 1916—3. P.M.**



The spirit of initiative should be specially encouraged in every soldier, as in the present war every man has an individual part to play, according to his duties, his rank, and his weapons. During the actual fighting the soldier can rely but little on the leadership of his superiors, who are merely expected to set the example, and who are frequently the first shot.

**DUTIES OF THE OFFICERS.** Before ordering their men to advance and while still in the trenches, the officers, assisted by their non-commissioned officers, should, whenever time and circumstances allow, strive to explain fully to every man what are the objectives to be attained and what means are to be employed. No details should be neglected.

The Major's duties will be to designate very clearly the fronts assigned to each of his companies, the objectives they are to reach, and the itineraries they are to follow. An assault is usually made in several waves, so the order of departure, the distance to be maintained between the successive waves, the place to station the reserves, and, if need be, the instructions relative to the juncture and reforming of the elements of the various companies, form so many points that must be settled beforehand in their minutest details.

The Major will have to decide beforehand how the battalion as well as the several companies will hold the objectives after capturing them, how they will organize these objectives in the shortest time possible, and how they will resist the counter-attacks. The officers in command of battalions and companies must not forget that, once the action has commenced, and often even before it is begun, all communications become difficult and frequently impossible, and that consequently all possible eventualities, within the orders received, must have been thoroughly studied in advance. So it is indispensable to give every man minute instructions.

This extract from a letter found on a French captain who was killed on the Meuse will give to young and inexperienced officers a good idea of the thoughts that must absorb the mind of an efficient commander.

"I am alone," he wrote, "in this underground shelter, still permeated with the foul atmosphere of the Germans, where the evidences of a disorderly flight, biscuits, bloody rags, stained letters, a biography of Hindenburg, etc., lie scattered in every direction. I am alone after having relieved the company that made the attack. I am alone

without counsel if I hesitate, without help if I weaken, in this captured trench which is half destroyed. My two hundred men are blindly piling in, ignorant of their surroundings, of what to do. The sight of them restores my waning energy. I have to think for them, and put everything in order before daybreak. I consult my watch: it is midnight."

Here is a Chief, a real leader! He goes out; until dawn he inspects his sector, he sets his men at work. To each he assigns a task; he stimulates them, prevents them from falling asleep, and does not spare himself. He can count on all his subordinates to do their best, and at the break of day, if the bombardment is resumed, if the counter-attack is launched, the trench will be ready; the losses will be lessened; resistance will have been made possible. It is by such methods, by the constant co-operation of the officer and his men, that the army performs marvellous feats. It is this constant co-operation, this comprehension of duty by the humblest leader, that enabled us to hold out at Verdun.

The most difficult missions should be entrusted to those known to be the best qualified to fulfil them.



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The most difficult missions should be entrusted to those known to be the best qualified to fulfil them.

Once the signal of attack is given, the officers and non-commissioned officers will scarcely have any other means of ensuring obedience to their orders than by setting an example to their men.

We take this occasion to render a profound homage to inferior ranking officers of the French armies. They indeed are and shall remain the heroes of this war. They have fallen on the field of honour since August, 1914, not by thousands but by tens of thousands. Never, under the most critical circumstances, has their morale weakened for a single moment. At all times, men equally as brave as their predecessors have been found to fill the places of those who had so heroically (I was going to say so cheerfully) gone down to death. By the sacrifice of their lives to their country, they have not only set an example to the officers of their Allies, but have also given the latter time to form and train themselves, and I can truthfully say, to equal them. The bravery displayed by the infantry officers of the English, Italian, and Russian armies is on a par with that of the French officers, and within a short time, the American officers, I am sure, will show themselves worthy of the same verdict.

Our officers have always and from the very





**South of La Bovelie Farm**  
January 29, 1917—12:30 P.M.



first day of the war invariably marched ahead of their men, leading them straight to the enemy. They have advanced through the most intense curtain-fire; they have exposed themselves to the fire of innumerable machine-guns; they have been the targets of rifles and grenades. Thousands have been killed; not one has hesitated, not one has turned back. The Allied officers have exhibited the same daring, the same bravery.

But what about the German officers? Is it possible not to contrast their attitude with that of our own? The German officers endeavour to keep under shelter as long as possible their precious persons, so greatly superior, in their own estimation, to those of their men, and when they do muster the courage to come out into the open, they are content to follow behind their troops, with revolvers in their hands to exact obedience.

We wish to reproduce here two or three citations taken at random among a thousand similar ones published in the *Journal Officiel de la République Française*, the official organ of the French Government, to give a vivid illustration of the way that officers ought to understand their duties:

On September 1, 1914, *Major Parisot de la Boisse* said to his chasseurs: "I give you my



word of honour, as long as one of us remains alive, the enemy shall not pass." In spite of heavy losses, though nearly surrounded, he extricated his troops and maintained the fight. The Pass de Mandray he defended remains French!

*Captain Robert Dubarle.* "A living example of impassibility under fire, contempt of danger, energy, and initiative."

*Captain Mazarde*—11th Chasseurs. "A splendid officer already cited at the order of the Division, of the Army Corps, and of the Army. From June 29th to July 14, 1915, he exhibited the bravery of a hero. While leading his Chasseurs to the air of *Sidi Brahim* in an attack upon a wood, he was stopped by wire entanglements at 50 metres from its edge. He maintained the line of attack for 36 hours, face to face with the enemy, repulsed a counter-attack, and riddled the line of the enemy with bullets and grenades. He withdrew only when ordered to do so, taking all his wounded and the bodies of the officers killed. He was shot, and died from his wounds."

*Captain Pierre Mercier*—67th Battalion of Chasseurs. "Entrusted with the mission of defending the passage of a bridge, he maintained his company under an intense fire. Outflanked on



West of Ailles

April 24, 1917—10.00 A.M.



both right and left, he did not hesitate to charge an enemy very superior in numbers, and fell mortally wounded, saying to his men, "We have done our duty."

Space does not allow us to give more numerous citations, but we think that it would benefit the American army to get the minutes of the war, to select therefrom the most brilliant citations of the French and English armies, to have them translated and widely distributed among the American troops. Nothing would be more instructive for the officers, nothing could better rouse their fire, nothing would inspire them with a greater desire to emulate their comrades in the Allied armies. The example of heroism is contagious for young men.

**SHOCK-TROOPS (STOSSTRUPPEN).** The continual failure of the German attacks or counter-attacks for more than a year led them to the creation of what they call *Stosstruppen*. The new recruits of the German army were lacking greatly in quality—the German soldier at best is wanting in initiative. The High Command therefore resorted to a selection of the best elements to be found in some of their divisions, with which to form battalions or companies for assault.



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The promise of receiving better and more abundant food than that given to the other troops (so important is the question of food to the German soldier, who has been on somewhat short rations since 1916) has been sufficient to bring forward volunteers for these companies.

These special troops are exempted from work in the trenches, and are brought up to the lines only when needed. On such occasions they are scattered all over the attacking front for the purpose of encouraging by their example the elements which are not so well organized.

The Germans, who, after the Russian revolution, were enabled to withdraw the best elements from their divisions on their Eastern Front, made, in June and July, 1917, a frequent use of their *Stosstruppen* in counter-attacks in Artois, and in desperate and daily attacks on the Chemin des Dames, but the result was far from expectation.

The *Stosstruppen*, obliged, like the ordinary troops, to attack in too serried ranks, offer a splendid target to artillery and machine-guns and, nine times out of ten, their rush is stopped before they can engage in a hand-to-hand fight.

We wonder what the German divisions on the Russian Front will be able to accomplish without



**La Bovelle**

**May 5, 1917—10.30 A.M.**





their best and strongest elements when the Russian Army rallies and re-enters the war in earnest.

### 3. **Mission and use of the infantry in a division.**

We have stated that a division includes three or four regiments. We will now dwell on the disposition of a division comprising two brigades of two regiments each. It seems certain that this is the type that will be adopted by the American Army, which possesses a sufficient number of men for this normal constitution of a division.

*Front of a division.* The front of a division in trench warfare is very variable in extent. The occupation of strong intrenchments, enabling the reserves to be sheltered from the enemy's fire, allows of the extension of the front, especially if the army remains on the defensive.

As soon as a division takes the offensive, however, its front is reduced to such proportions as will permit of energetic effort. The front of a division in the open field has been fixed at 1800 to 2000 metres. The operations in 1914 showed that the fronts were always longer than this and often twice as long and such will perhaps continue to be the case in future if the war in the open is resumed; but, so long as the war remains one

of intrenchments, it will be very dangerous not to limit the fronts, especially at the time of an offensive. This is an acknowledged truth, and there is a growing tendency, especially in the British Army, to shorten the front of attack of a division.

**DISPOSITIONS.** The most logical mode of disposing the troops in a division on the battlefield will always consist in the junction of the two brigades side by side, and, in the brigades, the junction of the regiments side by side.

The division, the brigade, the regiment, and even the battalion, have each to constitute reserves either to ensure success or to guard against possible failures in their offensive. In this warfare of position, even more perhaps than in one of movement, the necessity of always having troops near at hand, ready to repel counter-attacks, is imperative, owing to the fact that every repulse is followed by the enemy's occupation of a part of the line of defence which would have to be retaken later with great losses should the enemy be given time to organize themselves therein.

The disposition of the units in depth enables the Command, when the lines are cleverly constructed and their intercommunications well assured, to



**North of La Bovelle**

**April 24, 1917—10 A.M.**



keep only a few men in the severely bombarded spots, and to shelter the largest part of the troops where they cannot be injured.

The study of the last large operations, especially on the British Front, shows that the experience and training gained by the British troops in the field, and the cohesion of their artillery and infantry, have compelled the Germans to abandon their method of distributing their forces in 1916 and to adopt a quite different system of fighting.

In the battle of the Ypres-Menin road the Germans launched three divisions on a very narrow front, with three battalions, one from each division, on the first line.

Immediately behind each leading battalion a second was placed to support it. The other two battalions of each regiment of four battalion-formation, and the third battalion of the three battalion-regiments, were held in reserve in depth to try and check the English advance and to execute detailed counter-attacks.

Behind these divisions of attack, special troops, carefully selected, composed a general reserve, waiting in very solid shelters where they were protected from heavy-artillery bombardment. These reserves were used when the first line

divisions failed to check the enemy's advance, or when there was a chance of retaking lost ground by violent counter-attacks.

The natural consequence of this new distribution of the German troops is that to counteract it successfully very narrow fronts have to be adopted. Forces strong enough to repel the enemy, and permit no time for the supporting battalions to engage effectively, have to be placed on the first line. The first lines are to be backed up by reserves strong enough to oppose the enemy reserves without any loss of time. A general reserve is to be kept in readiness in sufficient force to hold the conquered positions against all counter-attacks which may be launched by the general reserves of the Germans.

The last operations of October show that these dispositions are now in force in all the armies.

DEFENSIVE. We have just explained the dispositions the Germans had to adopt on the defensive, and we think that all parties will perforce be led to adopt a somewhat similar distribution.

The power of resistance of the trench lines of the Allies being far inferior to that of the German lines, the Allies must, to guard against the danger of attack, take advantage of the superiority of



**La Bovelle**

**May 5, 1917—10.30 A.M.**





their artillery. They must dispose their forces in depth, in such a way as to ensure the repulse of the enemy by a succession of assaults that will stagger him and prevent him from re-forming.

It is impossible to give hard and fast rules for the distribution of forces between the different lines of the divisions, regiments, battalions, and companies. The distribution depends entirely on the nature of the operations, and is left for each unit to carry out in conformity with the orders received. When sufficiently detailed instruction has been given to a unit in the course of its training, these distributions are an easy matter to decide upon, provided the officers of all ranks perform conscientiously the duties we have indicated elsewhere.

ASSAULTING AND OCCUPATION TROOPS. Experience has suggested to the Allies to divide their fighting troops into army corps for assault and army corps for occupation.

Once the objectives are attained and strongly held, the assaulting troops are replaced by the occupation troops that arrive fresh on the ground. Their task, though one of defence, is often hard. They have to remain a long time in the first lines, exposed, by reason of the new German

methods, to frequent and severe bombardments, and obliged to repel numerous counter-attacks.

The generals commanding-in-chief are the exclusive judges of the part the different army corps will have to play, but, in our opinion, there is one principle which must never be ignored in war. In the army, as well as in the battalion and in the company, it is the duty of the Chief to select for action, irrespective of any rotation of service, that element of the troops under his command which he deems the one most likely to achieve the desired result.

What we have said concerning the use of the artillery, the armament of the infantry, the distribution of the infantry in the division and the trenches of attack, will enable us to give an exact idea of the physiognomy of an offensive action and of its preparation.

**OFFENSIVE ENGAGEMENTS. THEIR PREPARATION.** The preparation of attacks in a war of position is a long one. On account of the work it necessitates it is very difficult to conceal these preparations on the front from the opposing aviation, and also, alas! from the curiosity of the rear.

An attack can be determined upon only by order

of the General-in-Chief, who decides where and on what front it shall be made. He gives his instructions to the General in command of an army group, who, according to circumstances, employs one or several of his armies for the operation. Each General commanding an army prepares an order of operation for each of his army corps, and so on, until the precise instructions reach the elements of the first line.

The preparation then commences. It consists in establishing on the terrain under the protection of the batteries:

1st. The new lines of the infantry, and, if necessary, the communications between these lines;

2d. The location of the artillery of all calibres;

3d. The organization of the posts of command;

4th. The bringing up of the munitions and material of all kinds;

5th. The construction, at the rear of the front of attack, of railroads and ordinary roads in sufficient number, rather in excess of the estimated needs than otherwise;

6th. The organization of the reserves of infantry.

7th. The preparation for the evacuation of

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the wounded, and the installation of large field hospitals, as close as possible to the lines;

8th. The organization of stations of evacuation;

9th. The organization of the parks;

10th. The organization of the centres of supply, etc.

This enumeration, from which we have omitted the aviation, by reason of its special installations on appropriate grounds, gives a sufficient idea of the labour required in preparing an offensive, which takes generally several weeks to accomplish.

A few days before the attack, an effort is made to secure the mastery of the air. Destruction fire is then directed against the opposing trenches. The comparison of the different photographic plates handed daily to the General Staffs enables the Command to watch the progress of the destruction of the lines and positions of the enemy. When the destruction is deemed thorough enough, the order is given to attack, at given points, at a given hour of a certain day. The last operation of the artillery, called "the rolling surprise fire," consists in subjecting numerous portions of the front to a series of terrific and rapid bombardments, which leaves the enemy in doubt as to the



**Trench "Battemburg"**

**May 4, 1917 — Noon**



points against which the attacks of infantry are to be launched. At the time appointed these attacks commence. The field artillery covers its infantry by barrages as intense as possible. The first assaulting waves, followed by those of the supporting troops, rush to the objectives selected, drive off the enemy by all means at their disposal, occupy and organize them. If necessary, the reserves come in, either to help the assaulting troops, or to repulse the counter-attacks of the enemy, if any occur.

It was decided some time ago that the troops must not, yielding to their ardour, or the excitement of a too easily acquired success, go beyond the objectives that have been assigned to them. A close examination of the defensive dispositions of the Germans which we have described reveals the wisdom of this precaution. It does not follow that additional objectives cannot be taken on the same day, but in this case the additional advance will be made by a fresh attack and the effort will be distributed accordingly.

Documents found on Germans in Champagne, in August, furnish the following details of an attack they had prepared north of the Souain Hill. A similar attack had been rendered impossible





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Documents found on Germans in Champagne, in August, furnish the following details of an attack they had prepared north of the Souain Hill. A similar attack had been rendered impossible

by the action of the French at Verdun, and by the destruction of the gas reservoirs by the French artillery.

Three fresh divisions and fifteen companies of *stosstruppen* (shock-troops, or special troops of assault) were to lead the attack with light machine-guns, *minenwerfer*, signalmen, miners, sappers, gasmen, grenadiers, stretcher-bearers, and artillery patrols. Twelve "booty-squads" and twelve "destruction-squads" each composed of an officer and thirty-two men were to follow the *stosstruppen*. Arrangements had been made with a view to removing the captured guns.

They had prepared for a formidable discharge of a new gas by a six-company regiment of sappers.

The gas attack was to be launched for a quarter of an hour. A very strong artillery preparation was to follow, after which the *stosstruppen* were to rush forward.

The aviation was to play an important rôle, and the attack was to be made with the aid of all the means of liaison known: dispatch-runners, telephonists, optical signals, carrier-pigeons, luminous rockets, and wireless telegraphy.

Orders had been given to bring back as many



West of Ailles  
May 4, 1917—Noon



French gas-victims as possible, with a view to studying the effects of the new product.

On the 20th of November, 1917, the third English army, by a successful surprise attack, penetrated into the German lines to a great depth and on a large front.

This operation, prepared in the greatest secrecy, was carried out without the usual assistance of the artillery or barrages. The infantry attacked under the protection of numerous tanks which destroyed the wire entanglements and the most important obstacles.

We do not think that this method will henceforth become a rule.

Before launching this attack, the British Commander must have been informed by his aviation, or by some other means, that the German Front was lacking in artillery and infantry and he must very cleverly have taken advantage of this momentary situation.

Must we conclude that the rules of preparation of attack, as stated above, will not be applied hereafter? It is very doubtful, in view of the fact that the Germans have prepared in France too many lines of defence, one behind the other.

This English victory, however, shows that the

High Command, whenever in possession of information warranting the hope of success, will have to combine regularly prepared attacks with surprise attacks on points where the German effectives happen to be reduced.

The success of this operation on the Cambrai Front proves that, however strong a position may be, however numerous its wire defences, it will always be possible to take it when not protected by a sufficient force of artillery and infantry.

DEFENSIVE ENGAGEMENTS. When the troops have to withstand an attack on their lines, they must bear in mind the very sound principle of war that a passive resistance can only end in defeat. On the first lines all the elements necessary for as long a resistance as possible will have to be accumulated. The infantry will then have occasion to make a telling use of rifles, grenades, rifle machine-guns, and machine-guns in as great a number as possible. The supporting troops and the reserves must be ready to counter-attack the enemy without loss of time, and throw him out of any trenches he may occupy temporarily. We have often seen German attacks on advanced trenches repulsed in the very moment of success by a simple bayonet charge made by the troops



View taken about 10 A.M. during the attack of May 5, 1917





of the first lines. To the field artillery, however, belongs the most important rôle in repulsing the attacks of the enemy, and the "communiqués" of all the Allies show that eight out of every ten attacks are repulsed by barrage-fire. When the aviators can report in time exactly where the enemy troops are being massed for attack, the trench artillery can work great havoc in the ranks of those usually compact formations.

**PROLONGED ENGAGEMENTS.** What we have just said refers to attacks made from regularly organized lines which have not been entirely destroyed by shell-fire.

On a ground where fighting has been proceeding continuously, the trenches are entirely destroyed, and the men and machine-guns belonging to the first-line troops remain with no other shelter than shell-craters, which are, as far as possible, connected together during the night by shallow trenches, provided this work is not prevented by continuous shell-fire. The communication trenches with the rear do not exist any more; and connections can only be maintained with the utmost difficulty; by what means, we will later explain.

In order to resume the attack under such condi-

tions, it will be necessary to choose the exact moment when the enemy is supposed to be demoralized by the artillery, and to rush the troops forward. In nearly every case, the assistance of fresh troops or of troops that have suffered little will be needed.

These field operations are difficult and require from both the chiefs and the soldiers a resolute will to conquer, and a thorough knowledge of war conditions.

During the last battles on the Somme, on the Aisne, and at Verdun, advanced infantry fractions had to hold out for several days in shell-craters, not connected with one another, and often filled with water. The heavy enemy shell-fire rendered every move impossible and stopped the arrival of all supplies. The adverse lines were often merged into one another and from hole to hole grenade fighting was kept up. It was nevertheless under such trying conditions that our troops fought inch by inch to defend the French lines at Verdun, and their heroic resistance enabled the Command to prepare new positions, to redistribute the troops and to move them forward, after they had finally thwarted the great German effort.

POSTS OF COMMAND. In a division all the



View taken about 10 A.M. during the attack of May 5, 1917



commanders of units from the General of Division to the Major direct the fight from quarters called Command Posts. These quarters, rendered as much as possible proof to field-artillery fire, must overlook the battlefield. They are fitted with all the rapid means of communication, both telegraph and telephone. The wires, although numerous and deeply buried seldom resist the bombardment until the time of attack. As a last resource recourse is had to signals, optical devices, carrier-pigeons, and messengers. Apparatus for ground-telegraphy, which seems destined to come into general use, has lately been employed, but we have not seen it in operation.

As communications between the advanced lines and the rear have become so very difficult during the preparation bombardment and the barrages, which are often uninterruptedly kept up for several days, the western armies have again had recourse to the carrier-pigeons, which are furnished in large numbers by private societies, existing before the war. Their co-operation is very useful and helps to save many human lives. They are also sent out by airplanes whenever the use of wireless telegraphy is not deemed expedient. They render great service in keeping the front in communica-

tion with the rear, and are also of priceless value for connecting the rear with the front.

**SIGNALLING.** The difficulty of communication between the rear and the front during the bombardments will necessitate the increasing use of infantry aircraft for the direction of operations. The aircraft, connected by wireless with the various divisional headquarters, are able to send information and in turn, to receive and transmit orders by signal to the troops on the front.

These aircraft will also maintain a connection between the infantry and the field artillery, which must be close and continuous if demoralizing consequences, such as have only too frequently occurred in all camps, are to be averted.

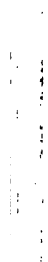
After the Anglo-German battles in Artois, the German prisoners, respectively of the infantry and the artillery, had to be separated, so great was the feeling between them. The infantrymen claimed they had not had sufficient protection, and wanted to "take it out" of the gunners.

So as to avoid confusion during infantry attacks, the guiding aircraft ordinarily send up but one sort of rocket-signal, indicating to the artillery either a lengthening or a shortening of the range by one hundred metres.



View taken about 10 A.M. during the attack of May 5, 1917





**BATTALIONS OF THREE COMPANIES.** At the same time that the effectives of certain divisions were reduced, the battalions were returned to a three-company formation.

A company of infantry is in principle composed of two hundred and fifty men, a quota which is however purely theoretical, as this number becomes rapidly reduced by various causes, such as illness, loss in battle, etc.

**FRAMEWORK OF THE ARMY.** The ranks of the officers and non-commissioned officers of the French Army have been renewed several times since the beginning of the war. Many captains in 1917 were mere privates in 1914 and most of them are very young. They are, generally, excellent officers, and it is to be regretted that those who have proved their worth are not even more rapidly promoted.

The spirit of routine that prevails in an army officered by soldiers of regular professional training is often responsible for the promotion to high command of men too old for the effective direction of a long and exhausting war like the present one.

There is no reason to think that the American people, any more than the British and the French, will meet with serious difficulties in recruiting

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and quickly training a strong staff of officers of all ranks. They will also, like the Allies, find no insuperable difficulties in filling the gaps which the enemy's fire will make among them.

**4. A word about cavalry.** If in this treatise we have not devoted a chapter to the use of cavalry it is because, since September, 1914, cavalry has had but few opportunities to operate as such.

The cavalry has been generally used in the present trench warfare in the same manner as the infantry. It has been reduced in number; that of the army corps has been suppressed, and only two squadrons have been allotted to each division.

Some regiments of cuirassiers have been dismounted, for want of proper horses.

But we think that, notwithstanding the small part the cavalry has taken in the war during the last thirty months, its opportunity is bound to come.

Some cavalry corps, comprising several divisions, have been retained, and during the offensives they are held in readiness to move to the front in case the enemy lines should be broken.

Cavalry squadrons rendered good services to

the British and French during the pursuit in March, 1917.

The Germans will perhaps not always be able to protect their retreats by the desert-like devastation of thirty or forty kilometres of country. Their weak point will be found some day or other, and on that day the cavalry will resume its importance.

The difficulty in feeding and obtaining horses seems to have compelled the Germans to reduce their cavalry forces considerably.

## CHAPTER VII

### FORBIDDEN WEAPONS

1. Asphyxiating gases.
2. Tear-producing gases.
3. "Gaz-vésicant."
4. Liquid fire.

1. **Asphyxiating gases.** During the present war Germany has ransacked the arcana of science for the means of destroying her enemies. Those to which she resorted had been forbidden and condemned as belonging to barbarous ages by all the conventions to which she had been a party, and by all the agreements that she had signed.

Asphyxiating gases were used for the first time against the British troops on the Yser. The corrosive vapours of chlorine are fatal to all who have been sufficiently exposed to them, and when first directed against an unprepared and unsuspecting enemy, their effects were terrible.

Fortunately the use of these gases is possible only when the wind is favourable and the weather

dry; and as the coincidence of these conditions is exceptional, especially in the north of France, the Allies had time to invent protective masks and distribute them to their troops.

The models adopted can be slipped on easily and quickly even in the dark and are effective for several hours. Every soldier is provided with one.

At the start, when gas-offensives were still in the experimental stage, the German attacks were limited to single discharges, which were more or less rapidly dissipated by the wind and were quite harmless to adversaries equipped with good masks.

But shortly afterward, when their weapons were turned against them, and their trenches were "gassed" by the Allies, and the Germans discovered by experience that a mask causes great fatigue and even exhaustion if its use is greatly prolonged (since it interferes so much with the breathing), they altered their method of procedure and began to take advantage of favourable winds to launch successive waves of gas, in order to wear their enemies out by keeping them in their masks as long as possible.

Next, as the approach of the whitish gas-cloud was easily visible and was always promptly sig-

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nalled by the lookouts, the German scientists, in an effort to catch their adversaries unprepared, modified their original formulas and produced colourless gases, which are more difficult but by no means impossible to detect.

**2. Tear-producing gases.** The next step was to find some means of nullifying as much as possible the protection of respiratory apparatus, so the *good* Germans invented the tear-producing gases which, in spite of the special glasses that have been added to the masks, rapidly interfere with vision and place the victim *hors de combat*.

The Allies were forced, in self-defence, to resort to similar means.

**3. "Gaz-vésicant."** A new gas invented also by the Germans has made its apparition on the Western Front. It is known in France under the name of *gaz-vésicant*; it acts after a few hours only; it is colourless and inodorous; it destroys all the tissues as thoroughly as they would be under the action of sulphuric acid.

We have mentioned the preponderant use of asphyxiating shells in neutralization fire. All our armies are now provided with a variety of gas-

generating apparatus, some of which have given excellent results as regards accuracy and rapidity of discharge.

There is another reason why the Germans should be unable to congratulate themselves on this invention. Westerly and north-westerly winds are more frequent in France than easterly winds, so that gas attacks can be made oftener by the Allies than by their enemies.

4. **Liquid fire** (*flammenwerfer*). When neither guns nor gases fulfilled their expectations and they saw that the "furor Teutonica" embodied in the mass-attacks of the best soldiers of the Kaiser was powerless to break through the Franco-British lines, the Germans resorted to the use of liquid fire.

In favourable weather before the attacks are launched, men in heavy bullet-proof steel breast-plates are sent forward, carrying on their backs reservoirs very similar to those used on farms to sprinkle sulphate on the crops. Through nozzles connected with these reservoirs they throw by the force of compressed air streams of burning liquid to a distance of fifty to sixty yards. The dense clouds of black smoke produced by the liquid



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fire mask its bearers from the sight of the enemy.

Liquid fire, especially at the beginning, when the Allies were unprepared for this mode of attack, rendered good service to the Germans by enabling them to take some advanced trenches at small cost to themselves.

The present results are less brilliant. Grenades have done the work against the mail-clad bearers of *flammenwerfer* that rifles or machine-guns could not. When a bearer falls, the masterless nozzle does not always continue to spit its flames in the direction of the enemy, but is often turned against the other bearers, and even against the very troops whose advance it is intended to protect, thus spreading great disorder in their ranks.

Recently, in order to compensate for the decreasing morale of their troops the Germans have resorted more and more to the use of *flammenwerfer*.

The Allies have in their turn adopted similar apparatus and the Germans have more than once had the opportunity to realize that it is as useful in the defensive as in the offensive.

Gas apparatus and *flammenwerfer* should be as portable and as handy as possible.

They should never be operated by other than

specialty trained troops, fully instructed and thoroughly skilled.

In France detachments of sappers or miners are entrusted with these devices.

## CHAPTER VIII

### CONCLUSION

WE have endeavoured to present, without entering into the technical details which are being taught by the officers composing the various Allied missions, a general sketch of the conditions and principal factors of modern warfare that will be sufficient to give an idea of a modern army and its operation in the field.

It is hoped that our explanations will aid in reading between the lines of the "communiqués," in comprehending the plan and the importance of individual engagements and finally in enabling those who have relatives at the Front to follow them at their posts of duty and to fully realize the importance of the parts assigned to them.

Before concluding, we should like to be granted the privilege of expressing our personal opinion concerning the methods calculated to hasten the instruction of the new armies of the United States.

Everyone agrees on the necessity of proceeding rapidly and effectively.

The defection of Russia on the Eastern Front and the recent very serious reverses of the Italians, of which the Germans have not failed to take prompt advantage, have rendered more difficult the efforts of the Allied Armies on the Western Front.

The instruction of the American units can be terminated in France, first in camps and afterwards in quiet sectors, until the American High Command considers that the moment has come to throw its forces into the thick of the fight.

Notwithstanding the immense resources of the United States, the difficulties of transportation will doubtless be such as to force the military authorities to hold a certain number of divisions in the instruction camps in America.

The instruction of these troops ought, we think, to be as thorough as possible.

The Allied countries have delegated to the United States distinguished officers who have participated in the war and who know all its difficulties. We should wish them to proceed, if only on a short front, with an exact reproduction of the shell-torn fields over which the American troops are destined to manœuvre in Europe.

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The small units that could be successively and frequently trained on these prepared fields would thereby have less time to spend in the instruction camps in France and could more promptly be sent to the Front.

In the vast territories of the United States, ground adapted to this purpose would not be difficult to find, and the plan would afford opportunity to give the last divisions to embark complete instruction in all matters of detail, and a perfect knowledge of all the component elements of an army, from those of a company to those of a division.

Let us insist on the fact that, in this war, the art of rapid excavation and intrenchment is one of the chief things to be learnt by the troops, as special formations cannot be detailed for this work, and every soldier has to carry an intrenching tool and must know how to use it.

It will therefore be necessary for the units to practise intrenchment on a large scale, and finally to perfect their instruction by exercise over shell-torn ground similar to that of the Front.

We would suggest, in order to familiarize the troops with the actual mode of destroying defensive works, practice with such obsolete artillery as is

not fitted for use at the Front. It is of paramount importance also to accustom the men as rapidly as possible to the sight and sound of gunfire. We would suggest that the final exercises of assault be accompanied by curtain fires made, to avoid all risks of accident, at about three hundred metres in advance of the first lines.

We can add that the mode of instruction we advocate here would be as beneficial to the Chiefs as to the men. Thus only will they fully realize beforehand the difficulties they will meet when facing the one factor which it is impossible to include in any course of training—the Enemy; an enemy that, to the end, will be skilled and formidable.



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